



Bangs Laboratories, Inc.

PRODUCT CATALOG

1988

30
YEARS

2018

• BEADS ABOVE THE REST •

THANK YOU

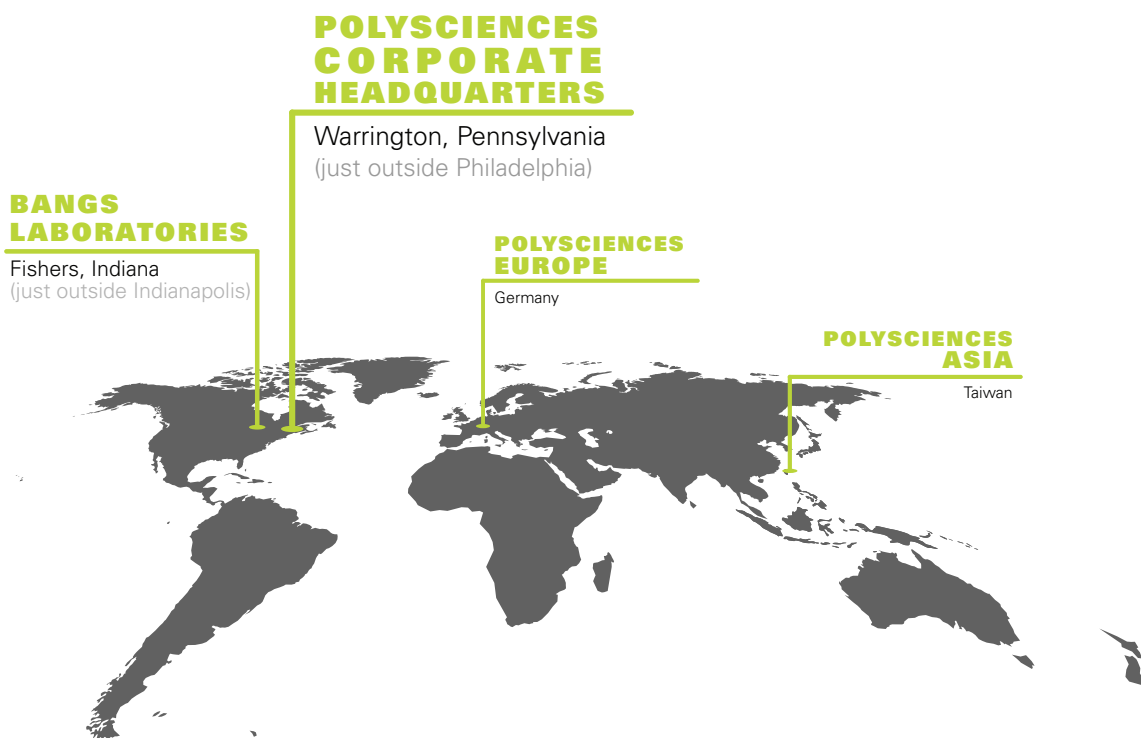


Bangs Laboratories' 30 years of experience in microsphere synthesis and fine particle analysis have established us as a leading manufacturer of polymer, silica and magnetic microspheres to diagnostic companies and instrument manufacturers. We understand what it takes to get new assays and instruments to market, and we have the products and the know-how to support you in your development process. We manufacture at scales that will carry you from R&D through production, and under an ISO 13485:2016 Quality System that will meet your regulatory needs. Our dyeing, coating and surface modification capabilities are demonstrated in our specialty products for bioseparations and instrument standardization, and we are also pleased to offer custom formulations, concentrations, and packaging.

Give us a call and let us put our decades of real-world experience to work for you!

CORPORATE LOCATIONS

Bangs is a wholly owned subsidiary of Polysciences, Inc. Through our corporate locations around the world, we are prepared to meet your global needs.



Bangs Laboratories, Inc.
9025 Technology Drive
Fishers, IN 46038
info@bangslabs.com

Polysciences, Inc.
400 Valley Road
Warrington, PA 18976
info@polysciences.com

Polysciences Europe GmbH
Badener Str. 13
69493 Hirschberg an der Bergstrasse
GERMANY
info@polysciences.de

Polysciences Asia Pacific, Inc.
2F - 1, 207 DunHua N. Rd.
Taipei, TAIWAN 10595
info@polysciences.tw



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MICROSPHERE SELECTION

Microspheres offer a highly convenient and flexible system for developing reagents for assays and bioseparations, and for use as instrument standards. As there are many varieties of microspheres available, it is important to think about the demands the application will place on them when making a base bead selection. Physical and optical properties should be considered in the context of handling and detection, and thought should also be given to requirements for diameter and size distribution, composition, surface chemistry, and any other needed properties.

| Size | Composition | Surface chemistry | Other properties |
|---------------------------------------|---|---|--|
| Diameter Uniformity / distribution | Density Refractive index Hydrophobicity / -philicity Nonspecific binding Autofluorescence | Reactive groups Level of functionalization Charge | Visible dye / fluorophore Superparamagnetic |

DIAMETER

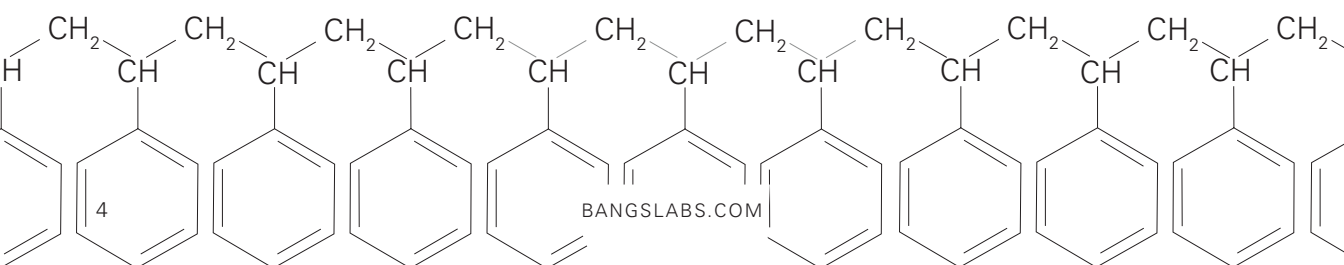
Microsphere size may be critical to the optimal performance of an assay, or it may be secondary to other characteristics. Considering traditional diagnostic methods, the test or assay format commonly dictates particle size, such as the use of very small spheres (~0.1 – 0.4µm) to ensure satisfactory wicking in lateral flow tests, or the use of larger, cell-sized spheres (~4 – 10µm) for bead-based flow cytometric assays. See application-specific TNs 301–305.

In magnetic separations, particularly those involving capture and elution of the target, the exact size of the magnetic particle may be unimportant provided that particles are in some general size range, and offer desired separation characteristics. See TN 102 and 102A, Magnetic Microspheres.

Diameter also determines surface area. Small-diameter spheres present more surface area per unit weight, while larger spheres present more surface area per bead. Size also affects ease of handling, processing considerations (such as the method used for separations [centrifugation, dialysis, filtration]), and the amount of ligand needed for coating.

COMPOSITION

Common microsphere compositions include polystyrene (PS), poly(methyl methacrylate) (PMMA) and silica. These materials possess different physical and optical properties, which may present advantages or limitations for different applications. See TSDs 0021 and 0022.



Polymer beads are generally hydrophobic, and as such, have high protein binding abilities. However, they also often require the use of some surfactant (e.g. 0.01 – 0.1% Tween® 20 or SDS) in the storage buffer to ensure ease of handling. During synthesis, functional monomers may be co-polymerized with styrene or methyl methacrylate to develop beads with surface reactive groups. Functional groups may be used in covalent binding reactions, and also aid in stabilizing the colloidal system.

Silica microspheres are inherently hydrophilic and negatively charged. Consequently, aqueous silica suspensions rarely require use of surfactants or other stabilizers. Carboxyl- and amine-functionalized silica spheres are available for use in common covalent coating protocols, and plain silica microspheres may be modified using a variety of silanes to generate functional groups or tailor surface properties.

SURFACE CHEMISTRY

Standard microsphere products support three basic coating strategies: adsorption, covalent coupling, and affinity binding. These methods are discussed in Microsphere Handling (page 10-11).

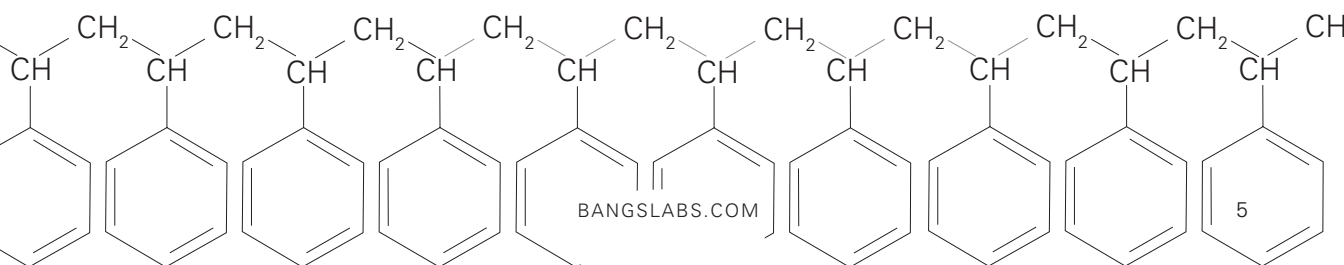
OTHER PROPERTIES

Many applications in the life sciences demand added traits, such as fluorescence or a visible color, or iron oxide inclusions for magnetic separations. Polymer spheres (and polymer-based magnetic spheres) may be internally dyed via an organic solvent swelling process, and many standard products are available. Many surface- or internally-labeled fluorescent beads are also available as specialized flow cytometry standards.

Various types of superparamagnetic microparticles are available—with different matrices, magnetite content, surface groups, etc. For new assays or applications, magnetic beads should be evaluated with application demands in mind.

| COMPOSITION | REFRACTIVE INDEX (589nm) | DENSITY (g/cm ³) | SOFTENING POINT (°C) |
|-------------|--------------------------|------------------------------|----------------------|
| PS | 1.59 | 1.05 | 95 |
| PMMA | 1.49 | 1.19 | 105 |
| Silica | 1.43-1.46* | 2.0* | >>1000 |

* Determined using representative samples. Other values are as reported in the literature for bulk polymer or silica.



MICROSPHERE SELECTION

PRODUCT CLASSIFICATION SYSTEM

After 30 years in the microparticle business we have produced an extensive inventory that caters to a wide range of applications. Our product classification applies to our “general use” products (found in the Test Developer section of this catalog). The classifications are Lot-specific designations that are noted with active inventory on our website, and indicate the manufacturing level of the product. We anticipate that this framework will be of most help to manufacturers of commercial microparticle reagents. The product classifications are as follows:

I. Validated Products

Manufacturing process with documented evidence that the process consistently yields a product with results that meet predetermined specifications and quality attributes. Manufacturing processes have been validated through the ISO 13485 Design and Development process.

II. Standard Products

Manufacturing process yields a product with results that meet predetermined specifications and quality attributes. Products and processes are not validated but are capable of being reproduced. Material is produced with validated equipment and test methods under ISO 13485 guidelines.

III. Supported Research Products

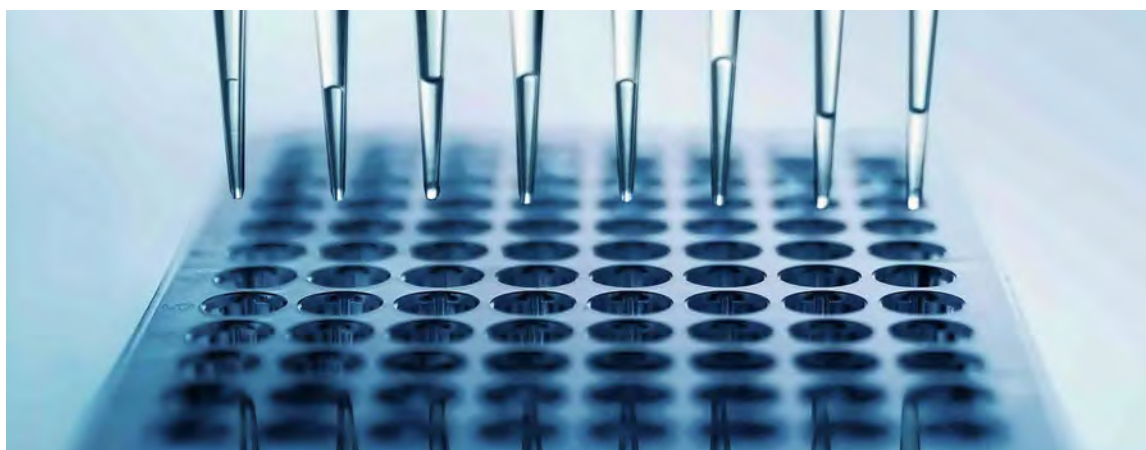
R&D manufacturing processes are conducted in accordance with established techniques, but may have some differences in formulation and/or the overall production process, as compared to Validated and Standard products. Manufacturing processes are documented, and may be repeated on a custom basis as needed.

IV. Unsupported Research Products

R&D manufacturing processes are conducted in accordance with established techniques, and these products have undergone basic characterization. Bangs has not made an effort to validate or reproduce the product.

DIAGNOSTIC APPLICATIONS

| Test / Assay Format | Bead Size | Bead Type | Coating Strategy | Detection Strategy | Doc. |
|---------------------------------------|--|---|-----------------------------------|---|----------------|
| Turbidimetric (Automated LAT) | 50nm – 500nm | Undyed | Covalent | Turbidimetry | TN304 |
| Magnetic Chemiluminescence | 1-5 μ m | ProMag [®] HP | Covalent | Luminescence | PDS 743 |
| Flow cytometric (suspension array) | 2 μ m – 15 μ m | QuantumPlex [™] or QuantumPlex [™] M (encoded populations for multiplexing) or Non-fluorescent (simplex or multiplex with different bead sizes) | Covalent or streptavidin / biotin | Flow cytometer | TN305 |
| Bead “ELISA” | 1-5 μ m | ProMag [®] , ProMag [®] HP | Covalent | Spectrophotometer | TN303 |
| Lateral Flow | 0.1 μ m – 0.4 μ m | Dyed (visible or fluorescent) | Covalent or adsorption | Visual or automated reader (absorbance, fluorescence) | TN303 |
| Lateral Flow – Boulders in the Stream | 0.1 μ m – 0.4 μ m mobile phase | Dyed (visible) mobile phase | Covalent or adsorption | Visual | TN303 |
| | ~2 μ m – 3 μ m capture phase | Undyed capture beads | | | |
| Dipstick | 0.1 μ m – 0.4 μ m | Dyed (visible) | Covalent or adsorption | Visual | TN303 |
| Latex Agglutination Test (LAT) | 0.2 μ m – 1.0 μ m | Undyed or visibly dyed | Covalent or adsorption | Visual (may be microscope-assisted) | TN201 TN301 |



DIAGNOSTIC APPLICATIONS



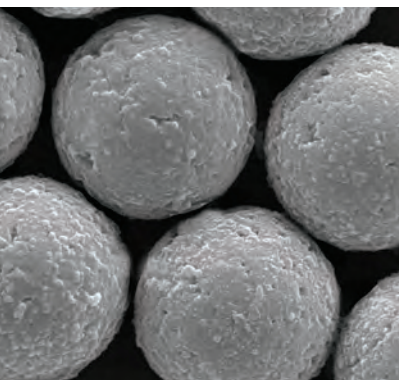
TURBIDIMETRIC ASSAYS

Turbidimetric assays permit the rapid and quantitative assessment of critical medical conditions, and the development of particle-enhanced versions has been known to increase sensitivities by 10- to 100-fold.

We offer carboxylated and plain polystyrene (“latex”) microspheres in the submicron diameters (0.05 μ m – 0.5 μ m) that are widely used for turbidimetric reagent development. The different surfaces support both covalent and adsorption protocols, allowing for the highly tailored coatings that are important to agglutination reactions. Additionally, our synthesis capabilities permit the manufacture of reproducible lots at the scales needed by OEM customers. See TN304, Light-Scattering Assays.

LATEX AGGLUTINATION TESTS (LATS)

In the classic LAT, beads are coated with antigen for the detection of antibody in serum or blood samples. If present, the antibody bridges antigen-coated microspheres, causing agglutination. Positive results are visually apparent as the homogeneous, milky white suspension takes on a grainy or sandy appearance. Undyed “white” spheres are often spotted on black cards, and dyed spheres may be applied to slides or white cards. See TN 301, Immunological Applications.



CHEMILUMINESCENCE ASSAYS

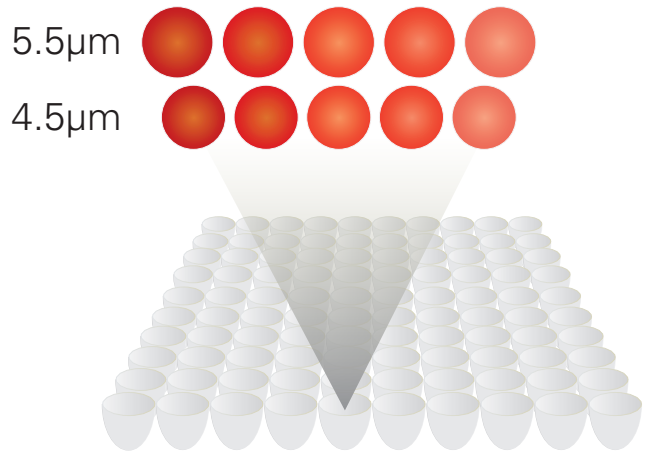
Chemiluminescent assays rely on the production of light by a chemical reaction rather than an external light source. Our ProMag® HP (High Performance) magnetic microspheres have been meticulously engineered for use in assay development. The highly optimized composition ensures lowest autosignal, particularly with respect to chemiluminescence and exposed iron. See PDS 743.

MAGNETIC PARTICLE ASSAYS

Magnetic microspheres confer a number of benefits, both in reagent manufacturing and assay performance. They present opportunities for automation, and offer easy and highly efficient separations. They are utilized extensively in traditional immunoassays, hybridization-based assays, molecular assays, gene sequencing, and proteomics. TNs 102 & 102A provide more details.

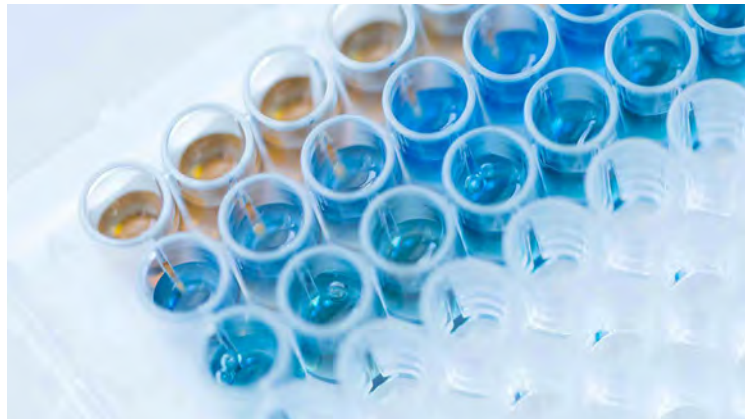
SUSPENSION ARRAYS

Suspension arrays for the flow cytometer feature populations of microspheres coated with different ligands for the interrogation of multiple targets within a single sample. Our QuantumPlex™ kits provide a general platform for multiplexed assay development on standard flow cytometers (488nm or 633nm Ex). Microsphere populations in 5-bead kits are encoded with different intensities of Starfire Red™, and the two size kits (4.4µm, 5.5µm) may be combined to extend the array. QuantumPlex™ M kits feature highly uniform 6µm magnetic microspheres. See TN 305, Suspension Arrays.



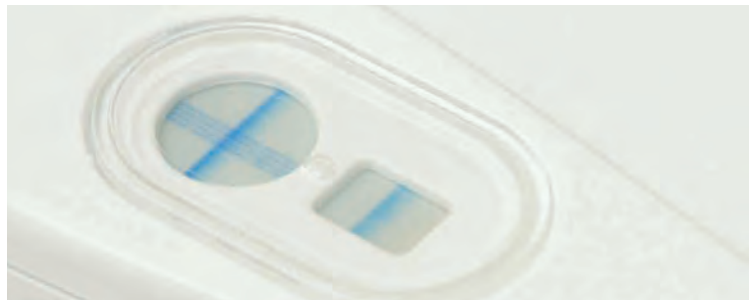
BEAD ELISAS

Bead-ELISAs have been developed using various types of microspheres, including micron-range polymer or magnetic microspheres or submicron polymer spheres. They offer increased surface area over traditional microplate ELISAs, and magnetic spheres, with their suitability for automation, can offer additional benefits with respect to reagent processing and assay performance. See TN 301, Immunological Applications.



LATERAL FLOW TESTS

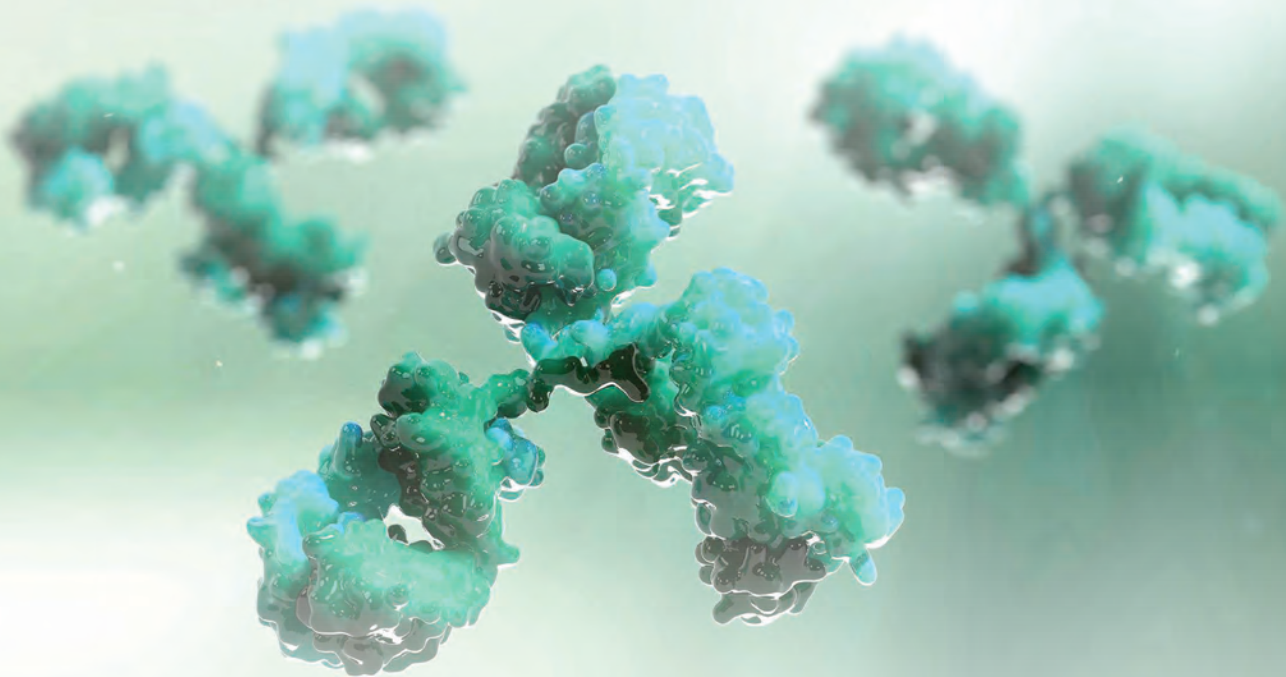
Dyed submicron microspheres are commonly used as the mobile phase in lateral flow tests. Vibrant colors permit visual detection of test results, and fluorescent versions such as europium chelate may be used with specialized readers. See TN 303, Lateral Flow Tests.



MICROSPHERE HANDLING

COATING

Microspheres are coated with ligands such as antibodies, oligonucleotides, peptides, etc. for use in diagnostics and bioseparations. Coatings are typically optimized to achieve desired specific activity while minimizing nonspecific interactions. Consideration should also be given to required stability, development time frame and budget, and the specific biomolecule to be coated. These factors will aid in determining the most fitting coating strategy for both short- and long-term objectives.



Adsorption

Adsorption relies primarily on hydrophobic interactions between the biomolecule and the polymer particle. Such coatings are fairly simple to conduct, involving incubation of the microspheres with the purified ligand. They typically require little optimization, and reagents may be developed relatively quickly. However, as adsorption relies on the formation of multiple attachment points between the ligand and particle, this strategy is typically reserved for use with proteins and non-functionalized polymer spheres. Adsorption is generally not suitable for hormones, peptides or nucleic acids in hybridization-based applications, and protein adsorption to silica is expected to be less efficient than to polymer. The use of microspheres with adsorbed protein coatings is often limited to formats featuring dry reagents (e.g. lateral flow tests where beads are dried on the membrane), rather than quantitative assays with suspended reagents. See TN 201, Working with Microspheres, and 204, Adsorption to Microspheres.

Covalent Coupling

Covalent coupling results in permanent attachment of the molecule to functionalized (e.g. carboxyl or amine) microspheres. It can provide needed stability when developing a commercial reagent, and for multiplexed assays, where analyte-specific bead populations are mixed. Additionally, specialized chemical linkers may be employed to address steric effects or to optimally orient the molecule. Although covalent binding protocols often involve a higher level of optimization than other approaches, coupling kits such as PolyLink are available to simplify the process. See TN 201, Working with Microspheres, and 205, Covalent Coupling.

Affinity Binding

Affinity binding is a straightforward method for immobilizing primary antibodies or biotinylated molecules. Proteins A and G and Fc-specific antibody coatings permit the directed immobilization of primary antibodies, and streptavidin is used extensively for the binding of biotinylated molecules such as antibodies, peptides and oligonucleotides. See TN 101, Affinity Ligand Microspheres, and 302, Molecular Biology.

It is important to note that each binding strategy has benefits and limitations, which should be weighed in the context of study objectives and the demands that will be placed on the finished reagent.

MICROSPHERE HANDLING

Washing

Washes are conducted as needed to normalize the buffer system, remove residuals that could interfere with ligand coating or activity, and transition microspheres through sequential steps of coating or use protocols.

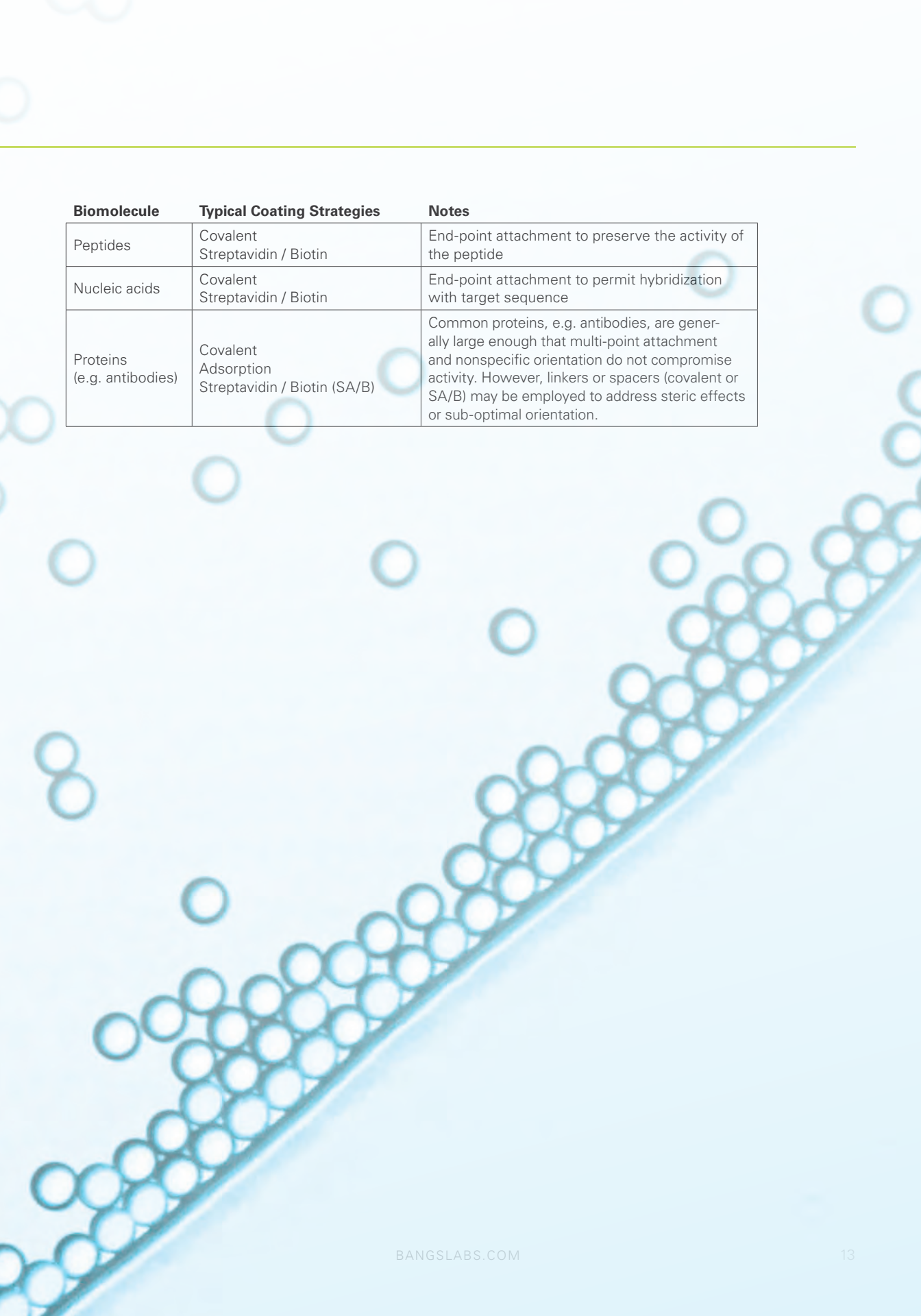
Rare earth or electromagnetic separators are used to perform washes for superparamagnetic microspheres; see our Biomagnetic Separators (pages 52-54) for options including single- and multi-tube and 96-well plate magnetic separators.

For non-magnetic microspheres, the wash method(s) should be selected with both microsphere size and throughput in mind. Centrifugation is commonly used for microspheres 0.5 $\mu\text{m}+$, while centrifugal filter devices*, dialysis or cross-flow filtration is typically employed for smaller (<0.5 μm) diameters. (*Cat. AA022, Vivaspin® 2mL Ultrafiltration Device, page 55)

A single wash may consist of microsphere separation/settling (centrifugation), supernatant removal, reconstitution of microspheres in buffer, with ~2-3 repetitions performed for a given wash step. See TN203, Washing Microspheres.

Aggregation

Our microspheres are available in a variety of compositions, including polystyrene, poly(methyl methacrylate), and silica. Though polymer microspheres are more susceptible to hydrophobic-mediated aggregation, there are several factors that may influence dispersity of the suspension. For example, low surface charge, small diameter (high surface area : volume ratio), high microsphere concentration, and sub-optimal buffer composition or pH may promote aggregation. Strategies that are effective in addressing aggregation thus counter these conditions, i.e. use of surfactant to reduce hydrophobicity (e.g. 0.01 – 0.1% Tween® 20 or SDS), sonication and rotation to disrupt and disperse aggregates, and adjusting microsphere concentration or buffer pH to deter contact between individual spheres. See TN 202, Microsphere Aggregation, and PDS 699 (Cat. ROTAT) for details about our Tube Rotator.



| Biomolecule | Typical Coating Strategies | Notes |
|-------------------------------|--|---|
| Peptides | Covalent Streptavidin / Biotin | End-point attachment to preserve the activity of the peptide |
| Nucleic acids | Covalent Streptavidin / Biotin | End-point attachment to permit hybridization with target sequence |
| Proteins (e.g. antibodies) | Covalent Adsorption Streptavidin / Biotin (SA/B) | Common proteins, e.g. antibodies, are generally large enough that multi-point attachment and nonspecific orientation do not compromise activity. However, linkers or spacers (covalent or SA/B) may be employed to address steric effects or sub-optimal orientation. |

POLYMER MICROSPHERES

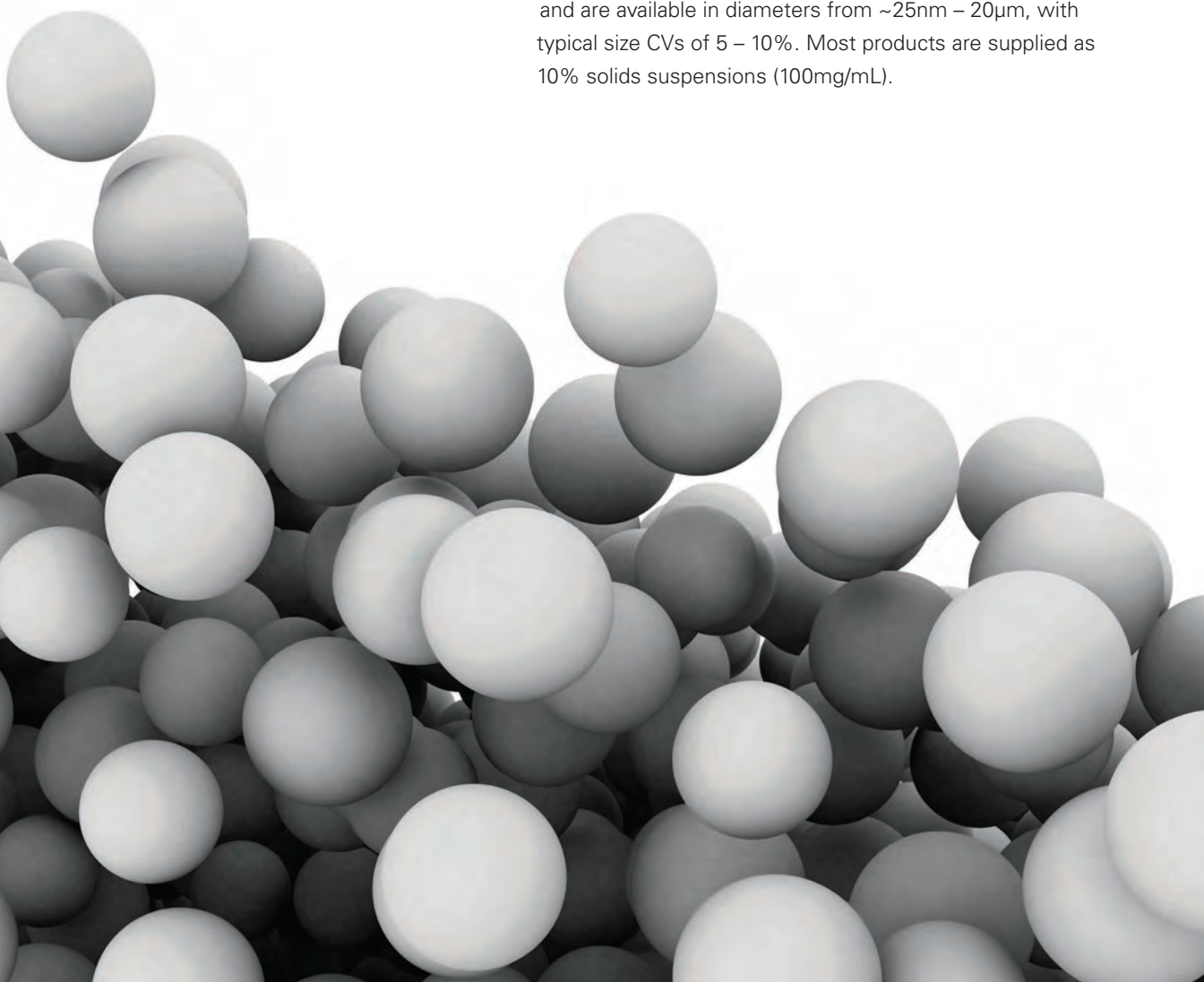
Polymer microspheres present a flexible platform for applications in diagnostics and bioseparations. They may be coated with ligands such as antibodies, antigens, peptides, or nucleic acids, and can be loaded with hydrophobic dyes and other compounds. Polymer microspheres also find extensive use as standards for instrument validation, set-up, and routine quality control.

| Polystyrene Properties | |
|---------------------------------------|------|
| Refractive Index (589nm)* | 1.59 |
| Density (g/cm ³)* | 1.05 |
| Softening Point, T _d (°C)* | 95 |

*Reported value for bulk polymer.

NON-FUNCTIONALIZED POLYMER MICROSPHERES

We offer uniform polystyrene (PS) and crosslinked poly(styrene/divinylbenzene) (PS / DVB) microspheres that may be used as-is for standards or markers, or coated with proteins via adsorption for use in diagnostic tests and assays. (See TechNote 204, Adsorption to Microspheres.) Our spheres are synthesized via emulsion polymerization, and are available in diameters from ~25nm – 20µm, with typical size CVs of 5 – 10%. Most products are supplied as 10% solids suspensions (100mg/mL).

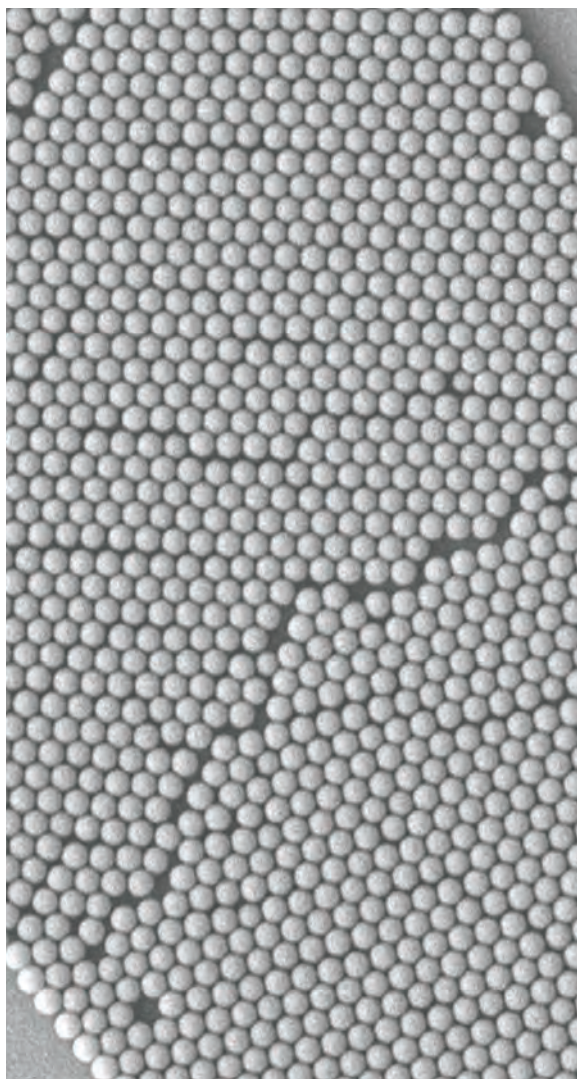


Plain Polystyrene

Antibodies and other proteins may be easily and stably adsorbed to hydrophobic, non-functionalized PS microspheres. Some products are crosslinked with divinylbenzene (DVB), which confers additional solvent and heat resistance. See TN204, Adsorption to Microspheres.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|-----------------------|
| PS02001 | 0.025 μ m | 0.015 - 0.035 μ m |
| PS02002 | 0.050 μ m | 0.040 - 0.060 μ m |
| PS02003 | 0.075 μ m | 0.065 - 0.085 μ m |
| PS02004 | 0.100 μ m | 0.090 - 0.110 μ m |
| PS02005 | 0.125 μ m | 0.115 - 0.135 μ m |
| PS02006 | 0.150 μ m | 0.140 - 0.160 μ m |
| PS02007 | 0.175 μ m | 0.165 - 1.185 μ m |
| PS02008 | 0.200 μ m | 0.190 - 0.210 μ m |
| PS02009 | 0.300 μ m | 0.270 - 0.330 μ m |
| PS02010 | 0.400 μ m | 0.370 - 0.430 μ m |
| PS03001 | 0.500 μ m | 0.470 - 0.530 μ m |
| PS03002 | 0.600 μ m | 0.570 - 0.630 μ m |
| PS03003 | 0.700 μ m | 0.670 - 0.730 μ m |
| PS03004 | 0.800 μ m | 0.770 - 0.830 μ m |
| PS03005 | 0.900 μ m | 0.870 - 0.930 μ m |
| PS04001 | 1.00 μ m | 0.95 - 1.05 μ m |
| PS05001 | 2.00 μ m | 1.80 - 2.20 μ m |
| PS05002 | 3.00 μ m | 2.80 - 3.20 μ m |
| PS05003 | 4.00 μ m | 3.80 - 4.20 μ m |
| PS06001 | 5.00 μ m | 4.80 - 5.20 μ m |
| PS06002 | 5.50 μ m | 5.30 - 5.70 μ m |
| PS06003 | 6.00 μ m | 5.80 - 6.20 μ m |
| PS06004 | 7.00 μ m | 6.80 - 7.20 μ m |
| PS06005 | 7.50 μ m | 7.30 - 7.70 μ m |
| PS07001 | 10.00 μ m | 9.50 - 10.50 μ m |
| PS07002 | 15.00 μ m | 14.50 - 15.50 μ m |
| PS07003 | 20.00 μ m | 19.00 - 21.00 μ m |
| PS08001 | >25 μ m | >25 μ m |

Plain polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~10% solids 100 mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

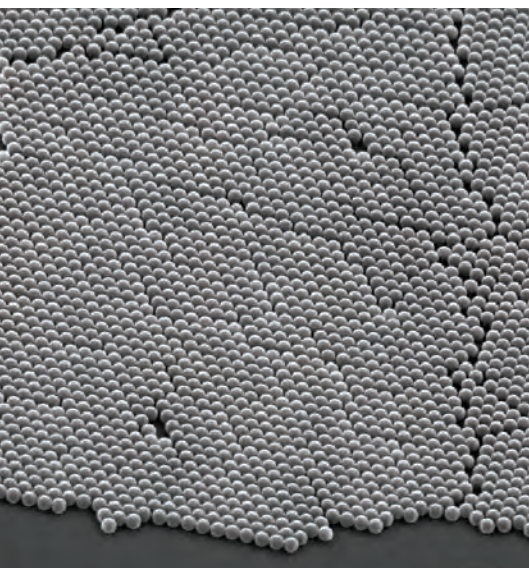


POLYMER MICROSPHERES

FUNCTIONALIZED POLYMER MICROSPHERES

Functionalized microspheres possess surface groups that may be used to generate covalently-bound coatings. These surface groups are also hydrophilic and potentially bear a charge, which may reduce hydrophobicity and contribute to ease of handling.

Our functionalized PS microspheres are suitable for the covalent immobilization of proteins, peptides, and nucleic acids. (See TN 205, Covalent Coupling.) They are synthesized via emulsion polymerization and are available in diameters up to ~20 μ m, with typical size CVs of 10%. Most products are supplied as 10% solids suspensions (100 mg/mL).



Amine Polymer

Amine-functionalized microspheres offer a trusted chemistry for the immobilization of biomolecules. Glutaraldehyde (Cat. # AA012) is often used to bind amine-containing compounds, and specialized linkers are available for targeted coupling of thiol or carbohydrate moieties to amine-functionalized microspheres. See TN 205, Covalent Coupling.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|-----------------------|
| PA02001 | 0.200 μ m | 0.190 - 0.210 μ m |
| PA03001 | 0.500 μ m | 0.470 - 0.530 μ m |
| PA03002 | 0.750 μ m | 0.740 - 0.760 μ m |
| PA04001 | 1.00 μ m | 0.95 - 1.05 μ m |

Amine polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~10% solids 100 mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Carboxyl Polymer

EDAC-mediated coupling is commonly used for the covalent immobilization of amine-terminated proteins, DNA, or other molecules to carboxyl-functionalized polymer [PS and P(S/DVB)] microspheres (EDAC Cat. # AA010). See TN 205, Covalent Coupling, for a protocol and tips on coating optimization and QC, or our PolyLink Protein Coupling Kit, page 46.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|-----------------------|
| PC02001 | 0.025 μ m | 0.015 - 0.035 μ m |
| PC02002 | 0.050 μ m | 0.040 - 0.060 μ m |
| PC02003 | 0.070 μ m | 0.061 - 0.080 μ m |
| PC02004 | 0.100 μ m | 0.090 - 0.110 μ m |
| PC02005 | 0.125 μ m | 0.115 - 0.135 μ m |
| PC02006 | 0.150 μ m | 0.140 - 0.160 μ m |
| PC02007 | 0.175 μ m | 0.165 - 0.185 μ m |
| PC02008 | 0.200 μ m | 0.190 - 0.210 μ m |
| PC02009 | 0.300 μ m | 0.270 - 0.330 μ m |
| PC02010 | 0.350 μ m | 0.340 - 0.360 μ m |
| PC02011 | 0.400 μ m | 0.370 - 0.430 μ m |
| PC03001 | 0.500 μ m | 0.470 - 0.530 μ m |
| PC03002 | 0.600 μ m | 0.570 - 0.630 μ m |
| PC03003 | 0.800 μ m | 0.770 - 0.830 μ m |
| PC03004 | 0.900 μ m | 0.870 - 0.930 μ m |
| PC04001 | 1.00 μ m | 0.95 - 1.05 μ m |
| PC05001 | 2.00 μ m | 1.80 - 2.20 μ m |
| PC05002 | 2.50 μ m | 2.30 - 2.70 μ m |
| PC05003 | 3.00 μ m | 2.80 - 3.20 μ m |
| PC05004 | 4.00 μ m | 3.80 - 4.20 μ m |
| PC05005 | 4.50 μ m | 4.30 - 4.70 μ m |
| PC06001 | 5.00 μ m | 4.80 - 5.20 μ m |
| PC06002 | 5.50 μ m | 5.30 - 5.70 μ m |
| PC06003 | 6.00 μ m | 5.80 - 6.20 μ m |
| PC06004 | 7.00 μ m | 6.80 - 7.20 μ m |
| PC07001 | 10.00 μ m | 9.50 - 10.50 μ m |
| PC07002 | 15.00 μ m | 14.50 - 15.50 μ m |
| PC07003 | 20.00 μ m | 19.00 - 21.00 μ m |
| PC08001 | >25 μ m | >25 μ m |



Carboxyl polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~10% solids 100 mg/mL) Please see Bangslabs.com for pricing or contact a local agent.

POLYMER MICROSPHERES

DYED MICROSPHERES

Visibly dyed microspheres are frequently used in lateral flow tests and “latex” agglutination tests. They are available in a range of intense colors that are suitable for visual or microscopic identification of positive test results.



Standard Visible Dye Colors

We offer polystyrene-based microspheres labeled with vibrant dyes for optimal visualization. Non-functionalized and carboxyl-functionalized surfaces are available to support adsorption and covalent immobilization strategies. Our visibly dyed microspheres are typically supplied as 5% solids suspensions (50mg/mL).

The adjacent color palette is provided to serve as a general reference only. Actual product hue may vary due to differences in microsphere composition and size, as well as the concentration of the suspension.

Dyed Polymer

Non-functionalized microspheres are suitable for coating with antibody or other large proteins via adsorption. See TN 204, Adsorption to Microspheres, for a general adsorption protocol.

| Catalog Number | Dye | Nominal Diameter | Specification Range |
|----------------|----------------|------------------|---------------------|
| DSCR001 | Crimson Red | 0.050µm | 0.040 - 0.060µm |
| DSCB002 | Cabo Blue | 0.200µm | 0.190 - 0.210µm |
| DSCR002 | Crimson Red | 0.200µm | 0.190 - 0.210µm |
| DSSG002 | Shamrock Green | 0.200µm | 0.190 - 0.210µm |
| DSBK002 | Basic Black | 0.200µm | 0.190 - 0.210µm |
| DSCR003 | Crimson Red | 0.300µm | 0.270 - 0.330µm |
| DSCR004 | Crimson Red | 0.400µm | 0.370 - 0.430µm |
| DSCB005 | Cabo Blue | 0.800µm | 0.770 - 0.830µm |
| DSCR005 | Crimson Red | 0.800µm | 0.770 - 0.830µm |
| DSSG005 | Shamrock Green | 0.800µm | 0.770 - 0.830µm |
| DSBK005 | Basic Black | 0.800µm | 0.770 - 0.830µm |
| DSCR006 | Crimson Red | 5.00µm | 4.80 - 5.20µm |

Dyed polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~5% solids 50mg/mL) Please see Bangslabs.com for pricing or contact a local agent.

Dyed Carboxyl Polymer

Biomolecules may be covalently immobilized to carboxyl-functionalized microspheres. A general coupling protocol is provided within TN205, Covalent Coupling; see also PolyLink Protein Coupling Kit, page 46.

| Catalog Number | Dye | Nominal Diameter | Specification Range |
|----------------|------------------|------------------|-----------------------|
| DCCB001 | Cabo Blue | 0.200 μ m | 0.190 - 0.210 μ m |
| DCCR001 | Crimson Red | 0.200 μ m | 0.190 - 0.210 μ m |
| DCSG001 | Shamrock Green | 0.200 μ m | 0.190 - 0.210 μ m |
| DCBK001 | Basic Black | 0.200 μ m | 0.190 - 0.210 μ m |
| DCCB002 | Cabo Blue | 0.500 μ m | 0.470 - 0.530 μ m |
| DCCR002 | Crimson Red | 0.500 μ m | 0.470 - 0.530 μ m |
| DCCB004 | Cabo Blue | 1.00 μ m | 0.95 - 1.05 μ m |
| DCCR004 | Crimson Red | 1.00 μ m | 0.95 - 1.05 μ m |
| DCTA004 | Tangerine Orange | 1.00 μ m | 0.95 - 1.05 μ m |
| DCSG004 | Shamrock Green | 1.00 μ m | 0.95 - 1.05 μ m |
| DCCB005 | Cabo Blue | 5.00 μ m | 4.80 - 5.20 μ m |
| DCCR005 | Crimson Red | 5.00 μ m | 4.80 - 5.20 μ m |
| DCBK005 | Basic Black | 5.00 μ m | 4.80 - 5.20 μ m |

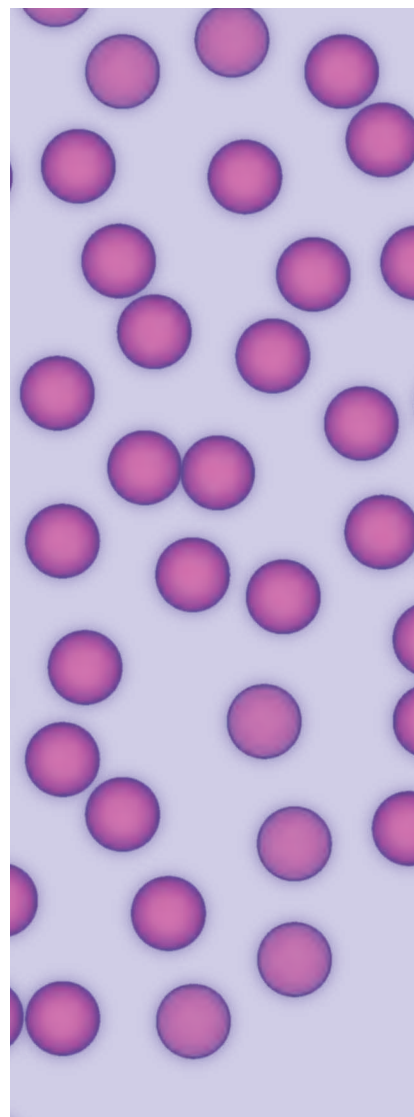
Dyed carboxyl polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~5% solids 50mg/mL)
Please see BangsLabs.com for pricing or contact a local agent.

Dyed Streptavidin-Coated Polymer

Our inventory includes a number of streptavidin-coated submicron to micron-sized visibly dyed (see fluorescent, page 24) spheres. Visit our website or contact us for specific availability.

| Catalog Number | Coating / Dye | Nominal Diameter | Specification Range |
|----------------|------------------|------------------|-----------------------|
| CDCR001 | SA / Crimson Red | 0.200 μ m | 0.190 - 0.210 μ m |
| CDCB001 | SA / Cabo Blue | 0.200 μ m | 0.190 - 0.210 μ m |

Dyed protein coated polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



~5 μ m red dyed microspheres

POLYMER MICROSPHERES

FLUORESCENT MICROSPHERES

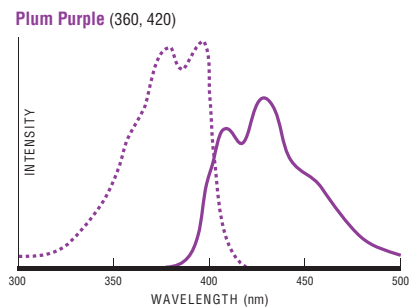
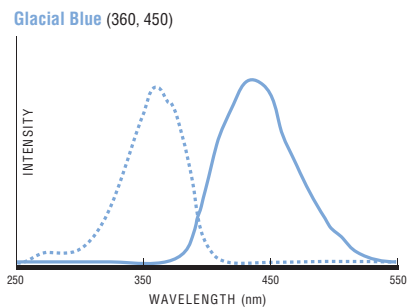
Many diagnostic and imaging applications rely on fluorescent microspheres for detection of binding events or signal enhancement. Addressable bead populations may be created with different intensities of fluorescence for the development of multiplexed suspension arrays, and small fluorescent spheres can function as the reporter for ELISA-type assays. Fluorescent microspheres are also useful for fluid tracing, cell tracking, or phagocytosis studies.

We offer polystyrene and crosslinked poly(styrene/divinylbenzene) microspheres as well as magnetic microspheres internally dyed with a variety of fluorescent dyes. Non-functionalized and carboxyl-functionalized surfaces are available to support adsorption and covalent immobilization strategies. Our fluorescent microspheres are supplied as 1% solids suspensions (10mg/mL).

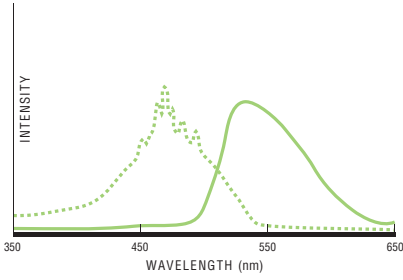
Fluorescence Spectra

Bangs offers many diameters of microspheres dyed with our standard fluorophores including PS, PS-COOH, and magnetic versions. The excitation and emission maxima are noted with each set of spectra. For example, Glacial Blue (360, 450) excites maximally at 360nm and has its greatest emission at 450nm.

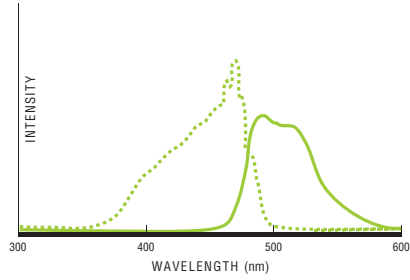
Spectra are provided to assist customers with the selection of appropriate fluorescent microspheres, and are not offered as a guarantee of performance.



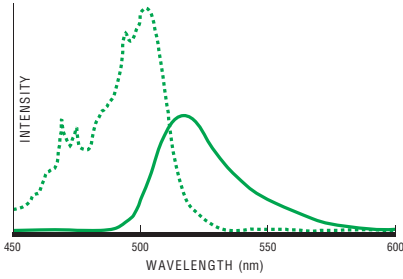
Surf Green (470, 525)



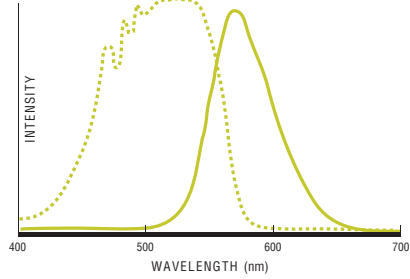
Yellow Green (YG) (441, 486)



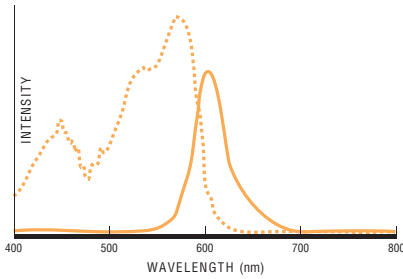
Dragon Green (480, 520)



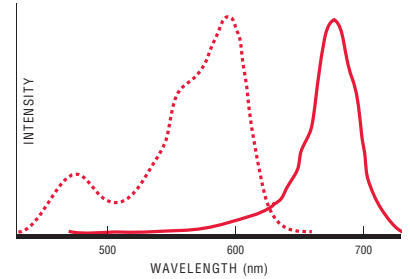
Envy Green (525, 565)



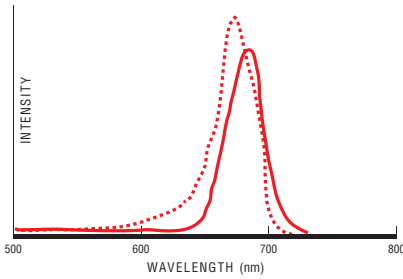
Suncoast Yellow (540, 600)



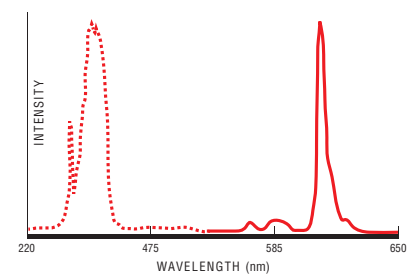
Far-Out Red (475, 590; 663)



Flash Red (660, 690)



Europium Chelate (365, 610)



POLYMER MICROSPHERES

Fluorescent Polymer

Non-functionalized microspheres are suitable for coating via adsorption. See TN 204, Adsorption to Microspheres, for a general adsorption protocol.

| Catalog Number | Fluorescence Color | Nominal Diameter | Specification Range |
|----------------|--------------------|------------------|---------------------|
| FSDG001 | Dragon Green | 0.050µm | 0.040 - 0.060µm |
| FSFR001 | Flash Red | 0.050µm | 0.040 - 0.060µm |
| FSDG002 | Dragon Green | 0.200µm | 0.190 - 0.210µm |
| FSSY002 | Suncoast Yellow | 0.200µm | 0.190 - 0.210µm |
| FSFR002 | Flash Red | 0.200µm | 0.190 - 0.210µm |
| FSDG003 | Dragon Green | 0.500µm | 0.470 - 0.530µm |
| FSPP003 | Plum Purple | 0.500µm | 0.470 - 0.530µm |
| FSFR003 | Flash Red | 0.500µm | 0.470 - 0.530µm |
| FSDG004 | Dragon Green | 1.00µm | 0.95 - 1.05µm |
| FSEG004 | Envy Green | 1.00µm | 0.95 - 1.05µm |
| FSPP004 | Plum Purple | 1.00µm | 0.95 - 1.05µm |
| FSFR004 | Flash Red | 1.00µm | 0.95 - 1.05µm |
| FSDG005 | Dragon Green | 2.00µm | 1.80 - 2.20µm |
| FSPP005 | Plum Purple | 2.00µm | 1.80 - 2.20µm |
| FSFR005 | Flash Red | 2.00µm | 1.80 - 2.20µm |
| FSDG006 | Dragon Green | 4.00µm | 3.80 - 4.20µm |
| FSEG006 | Envy Green | 4.00µm | 3.80 - 4.20µm |
| FSFR006 | Flash Red | 4.00µm | 3.80 - 4.20µm |
| FSDG007 | Dragon Green | 7.50µm | 7.30 - 7.70µm |
| FSSY007 | Suncoast Yellow | 7.50µm | 7.30 - 7.70µm |
| FSFR007 | Flash Red | 7.50µm | 7.30 - 7.70µm |
| FSEG008 | Envy Green | 10.00µm | 9.50 - 10.50µm |
| FSDG009 | Dragon Green | 15.00µm | 14.50 - 15.50µm |
| FSDG011 | Dragon Green | >25.00µm | >25.00µm |

Fluorescent polystyrene comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL)
Please see BangsLabs.com for pricing or contact a local agent.



Fluorescent Carboxyl Polymer

Biomolecules may be covalently immobilized to carboxyl-functionalized microspheres. A general coupling protocol is provided in TN205, Covalent Coupling, or with our PolyLink Protein Coupling Kit, page 46.

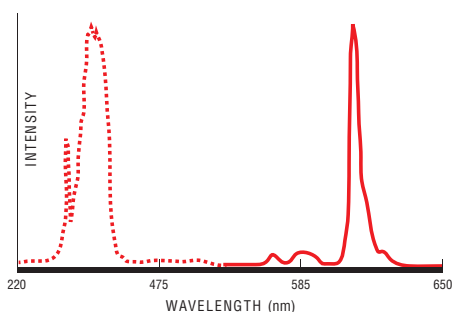
| Catalog Number | Fluorescence Color | Nominal Diameter | Specification Range |
|----------------|--------------------|------------------|-----------------------|
| FCDG001 | Dragon Green | 0.050 μ m | 0.040 - 0.060 μ m |
| FCFR001 | Flash Red | 0.050 μ m | 0.040 - 0.060 μ m |
| FCDG002 | Dragon Green | 0.100 μ m | 0.090 - 0.110 μ m |
| FCDG003 | Dragon Green | 0.200 μ m | 0.190 - 0.210 μ m |
| FCSG003 | Surf Green | 0.200 μ m | 0.190 - 0.210 μ m |
| FCFR003 | Flash Red | 0.200 μ m | 0.190 - 0.210 μ m |
| FCGB003 | Glacial Blue | 0.200 μ m | 0.190 - 0.210 μ m |
| FCDG004 | Dragon Green | 0.400 μ m | 0.370 - 0.430 μ m |
| FCFR004 | Flash Red | 0.400 μ m | 0.370 - 0.430 μ m |
| FCDG005 | Dragon Green | 0.500 μ m | 0.470 - 0.530 μ m |
| FCFR005 | Flash Red | 0.500 μ m | 0.470 - 0.530 μ m |
| FCDG006 | Dragon Green | 1.00 μ m | 0.95 - 1.05 μ m |
| FCEG006 | Envy Green | 1.00 μ m | 0.95 - 1.05 μ m |
| FCSY006 | Suncoast Yellow | 1.00 μ m | 0.95 - 1.05 μ m |
| FCGB006 | Glacial Blue | 1.00 μ m | 0.95 - 1.05 μ m |
| FCFR006 | Flash Red | 1.00 μ m | 0.95 - 1.05 μ m |
| FCSY007 | Suncoast Yellow | 2.00 μ m | 1.80 - 2.20 μ m |
| FCDG008 | Dragon Green | 5.00 μ m | 4.80 - 5.20 μ m |
| FCEG008 | Envy Green | 5.00 μ m | 4.80 - 5.20 μ m |
| FCGB008 | Glacial Blue | 5.00 μ m | 4.80 - 5.20 μ m |
| FCFR008 | Flash Red | 5.00 μ m | 4.80 - 5.20 μ m |
| FCDG009 | Dragon Green | 10.00 μ m | 9.50 - 10.50 μ m |
| FCDG011 | Dragon Green | 15.00 μ m | 14.50 - 15.50 μ m |

Fluorescent carboxyl polystyrene comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



POLYMER MICROSPHERES

Europium Chelate (365, 610)



Europium Chelate

Our Europium Chelate products offer extremely bright fluorescence and exceptional stability, in addition to well-functionalized carboxylated surfaces for the covalent attachment of ligand. Rare earth lanthanide chelates exhibit longer (microsecond) lifetimes, allowing fluorescence decay to be monitored in time-resolved fluorescence (TRF) based assays. Europium Chelate products are characterized by long Stokes shifts, or intervals between fluorescence excitation and emission maxima. This property lends itself to low background signal, and avoids regions of fluorescence overlap with other common reporters in multicolor assays.

| Catalog Number | Description | Nominal Diameter | Specification Range |
|----------------|-------------------------|------------------|---------------------|
| FCEU001 | Europium Chelate - COOH | 0.100µm | 0.090 - 0.110µm |
| FCEU002 | Europium Chelate - COOH | 0.200µm | 0.190 - 0.210µm |
| FCEU003 | Europium Chelate - COOH | 0.300µm | 0.270 - 0.330µm |

Fluorescent carboxyl polystyrene comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Fluorescent Streptavidin-Coated Polymer

Our inventory typically includes streptavidin-coated fluorescent microspheres available in 0.2µm, 0.4µm, 0.5µm, and 1.0µm diameters. Visit our online Products section or contact us for specific availability.

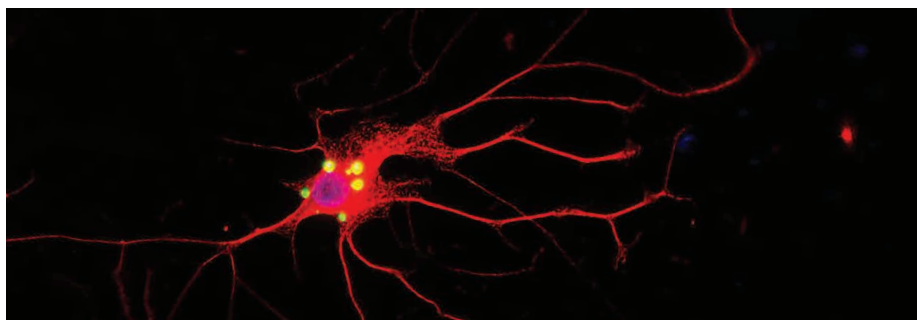
| Catalog Number | Coating / Dye | Nominal Diameter | Specification Range |
|----------------|-------------------|------------------|---------------------|
| CFDG000 | SA / Dragon Green | 0.200µm | 0.190 - 0.210µm |
| CFDG001 | SA / Dragon Green | 0.400µm | 0.370 - 0.430µm |
| CFFR001 | SA / Flash Red | 0.400µm | 0.370 - 0.430µm |
| CFDG002 | SA / Dragon Green | 0.500µm | 0.470 - 0.530µm |
| CFDG003 | SA / Dragon Green | 1.00µm | 0.95 - 1.05µm |
| CFFR003 | SA / Flash Red | 1.00µm | 0.95 - 1.05µm |

Fluorescent streptavidin polystyrene comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Fluorescent Magnetic

Our fluorescent magnetic microspheres have been used for cell tracking and assay development.

QuantumPlex™ offers a ready platform for suspension array development, page 27.



| Catalog Number | Description | Fluorescence Color | Nominal Diameter | Specification Range |
|----------------|------------------------------|--------------------|------------------|---------------------|
| MCDG001 | Classical Magnetic - COOH | Dragon Green | 0.90µm | 0.50 - 2.00µm |
| MCFR001 | Classical Magnetic - COOH | Flash Red | 0.90µm | 0.50 - 2.00µm |
| MEDG001 | Encapsulated Magnetic - COOH | Dragon Green | 0.86µm | 0.50 - 2.00µm |
| MEFR001 | Encapsulated Magnetic - COOH | Flash Red | 0.86µm | 0.50 - 2.00µm |
| MEDG002 | Encapsulated Magnetic - COOH | Dragon Green | 1.63µm | 0.50 - 2.00µm |
| MESY002 | Encapsulated Magnetic - COOH | Suncoast Yellow | 1.63µm | 0.50 - 2.00µm |
| MEGB002 | Encapsulated Magnetic - COOH | Glacial Blue | 1.63µm | 0.50 - 2.00µm |
| MEFR002 | Encapsulated Magnetic - COOH | Flash Red | 1.63µm | 0.50 - 2.00µm |
| UMGB001 | COMPEL - COOH | Glacial Blue | 3µm | 2.50 - 3.50µm |
| UMDG001 | COMPEL - COOH | Dragon Green | 3µm | 2.50 - 3.50µm |
| UMEG001 | COMPEL - COOH | Envy Green | 3µm | 2.50 - 3.50µm |
| UMFR001 | COMPEL - COOH | Flash Red | 3µm | 2.50 - 3.50µm |
| UMGB002 | COMPEL - COOH | Glacial Blue | 6µm | 5.50 - 6.50µm |
| UMDG002 | COMPEL - COOH | Dragon Green | 6µm | 5.50 - 6.50µm |
| UMFR002 | COMPEL - COOH | Flash Red | 6µm | 5.50 - 6.50µm |
| UMGB003 | COMPEL - COOH | Glacial Blue | 8µm | 7.50 - 8.50µm |
| UMDG003 | COMPEL - COOH | Dragon Green | 8µm | 7.50 - 8.50µm |
| UMFR003 | COMPEL - COOH | Flash Red | 8µm | 7.50 - 8.50µm |

Fluorescent magnetic polymer comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

POLYMER MICROSPHERES

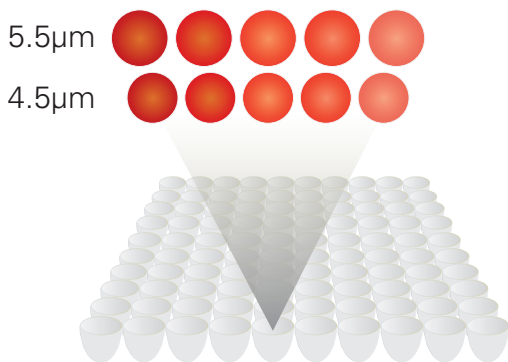
SUSPENSION ARRAYS

Suspension arrays for the flow cytometer feature populations of microspheres coated with different ligands for the interrogation of multiple targets within a given sample. Ligand-specific microsphere populations are encoded so that results for corresponding individual targets may be discerned. Encoding may be in the form of microsphere size and/or fluorescence signature, as with our QuantumPlex™ and QuantumPlex™M platforms.

QUANTUMPLEX™

Our QuantumPlex kits provide a general platform for multiplexed assay development on standard flow cytometers. Microsphere populations in 5 - bead kits are encoded with different intensities of Starfire Red™ and the two size kits (4.4 μm, 5.5 μm) may be combined to extend the array. Starfire Red™ excites at 488nm or 635nm, and emits in the red channel (e.g., PE-Cy™5, APC) with very little carryover into lower wavelengths, which leaves other detectors available for determination of positive binding events via common reporters such as FITC and PE.

QuantumPlex kits are available with two different surfaces to accommodate the coating strategy of choice: carboxyl (COOH) and streptavidin (SA).



| Catalog Number | Description |
|----------------|--|
| 235 | QuantumPlex COOH 4.4µm, 5 populations |
| 238 | QuantumPlex COOH 5.5µm, 5 populations |
| 239 | QuantumPlex COOH 4.4µm and 5.5µm, 10 populations |
| 215 | QuantumPlex SA 4.4µm, 5 populations |
| 218 | QuantumPlex SA 5.5µm, 5 populations |
| 219 | QuantumPlex SA 4.4µm and 5.5µm, 10 populations |

QuantumPlex comes in 1mL(pop 5 x 100 data points), 5mL(pop 5 x 500 data points), and 10mL(pop 5 x 1000 data points).

QuantumPlex™ SP

QuantumPlex SP (Single Population) is useful for the development of simplex flow cytometric assays or for the optimization of attachment chemistry and assay parameters before transitioning to a multiplexed format. Like QuantumPlex, they are dyed with Starfire Red™ and are suitable for use on standard flow cytometers.

| Catalog Number | Description |
|----------------|------------------------------|
| 234 | QuantumPlex SP COOH 4.4µm |
| 237 | QuantumPlex SP COOH 5.5µm |
| 214 | QuantumPlex SP SA 4.4µm |
| 217 | QuantumPlex SP SA 5.5µm |

QuantumPlex SP comes in 1mL (100 data points) and 3mL (300 data points)

QuantumPlex™ M

QuantumPlex M (Magnetic) kits consist of five populations of ~6µm highly uniform superparamagnetic microspheres encoded with different intensities of Starfire Red™. Like QuantumPlex, they are suitable for use on standard flow cytometers. Highly efficient separations may be performed using rare earth magnetic separators.

| Catalog Number | Description |
|----------------|-------------------------------------|
| 250 | QuantumPlex M COOH 5 populations |
| 252 | QuantumPlex M SA 5 populations |

QuantumPlex M comes in 1mL (pop 5 x 100 data points), 5mL (pop 5 x 500 data points), and 10mL (pop 5 x 1000 data points).

QuantumPlex™ M SP

QuantumPlex M SP is useful for the development of simplex flow cytometric assays, or for the optimization of attachment chemistry and assay parameters before transitioning to a multiplexed format. Like QuantumPlex M, they are ~6µm highly uniform superparamagnetic microspheres dyed with Starfire Red™ and are suitable for use on standard flow cytometers.

| Catalog Number | Description |
|----------------|-----------------------|
| 251 | QuantumPlex M SP COOH |
| 253 | QuantumPlex M SP SA |

QuantumPlex M SP comes in 1mL (100 data points) and 3mL (300 data points)

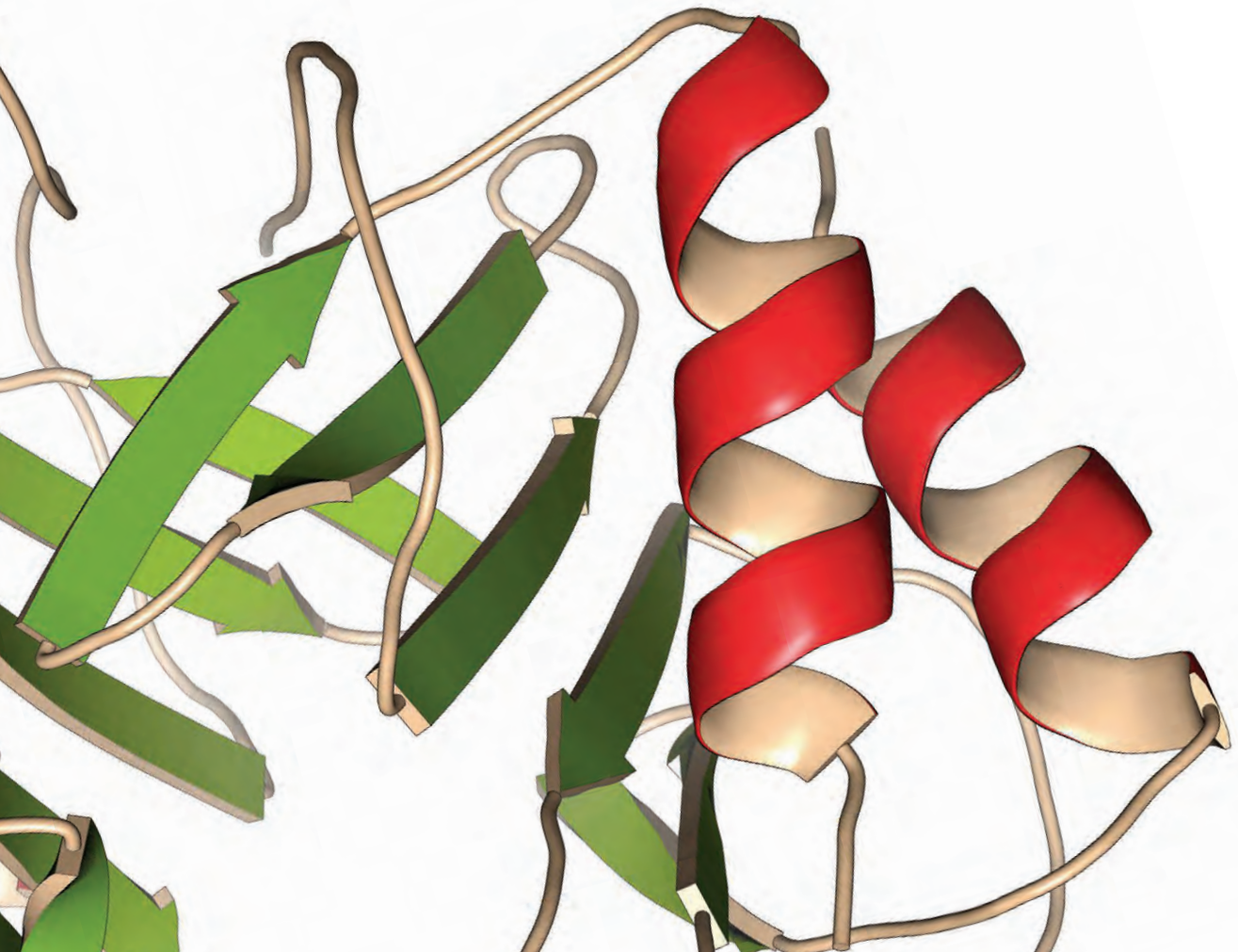
POLYMER MICROSPHERES

AFFINITY LIGAND COATED MICROSPHERES

When circumstances call for the rapid development of microsphere reagents, particles coated with affinity ligands offer a ready solution. Affinity binding protocols are straightforward, typically involving a simple incubation of the coated spheres with the appropriate binding protein. Binding proteins also provide an opportunity to optimally orient the ligand, as with the end-point immobilization of biotinylated oligonucleotides to streptavidin-coated microspheres, or the Fc-specific immobilization of antibodies via Protein A or G.

Particles coated with binding proteins also find significant use in purifications. Streptavidin-coated microspheres are often used in the isolation of biotinylated PCR amplicons. Protein A and Protein G microspheres are utilized for purification of antibodies and Fc-tagged fusion proteins, as well as for the recovery of Ab/Ag complexes in immunoprecipitation.

The activity of each Lot of coated microspheres is determined through binding of an appropriate fluorophore-conjugated ligand and spectrofluorimetric assay. The resulting binding capacity is reported on the Certificate of Analysis that accompanies product shipment.



Streptavidin

Our streptavidin- and SuperAvidin™- coated polystyrene microspheres offer simple and extremely stable binding of biotinylated molecules such as antibodies, peptides, and oligonucleotides for use in diagnostics, screening, and affinity purifications. See TN 101, Affinity Ligand Microspheres, and PDS 721.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| CP01000 | 0.100µm | 0.090 - 0.110µm |
| CP01001 | 0.200µm | 0.190 - 0.210µm |
| CP01003 | 0.500µm | 0.470 - 0.530µm |
| CP01004 | 1.00µm | 0.95 - 1.05µm |
| CP01005 | 3.00µm | 2.80 - 3.20µm |
| CP01006 | 5.00µm | 4.80 - 5.20µm |
| CP01007 | 10.00µm | 9.50 - 10.50µm |
| CP01008 | 15.00µm | 14.50 - 15.50µm |

Streptavidin coated polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

| Catalog Number | Description | Nominal Diameter | Specification Range |
|----------------|--------------------------|------------------|---------------------|
| CMC0100 | SA Classical Magnetic | 0.2 - 0.5µm | 0.2 - 0.5µm |
| CME0101 | SA Encapsulated Magnetic | 0.7 - 1.2µm | 0.7 - 1.2µm |
| UMC0100 | SA COMPEL Magnetic | 3µm | 2.50 - 3.50µm |
| UMC0101 | SA COMPEL Magnetic | 6µm | 5.50 - 6.50µm |
| UMC0102 | SA COMPEL Magnetic | 8µm | 7.50 - 8.50µm |

Streptavidin coated magnetic polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Biotin

The avidin / biotin interaction is one of the strongest non-covalent bonds ($K_a=10^{15}/M$ vs. 10^7 - $10^{11}/M$ for antibody-antigen interactions). This secure bond, combined with the small size of biotin (MW=244.3), yields an ideal system for affinity binding, with numerous applications in areas such as immunology and cell / molecular biology. See TN101 and PDS 724.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| CP10000 | 10.00µm | 9.50 - 10.50µm |

Biotin coated polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

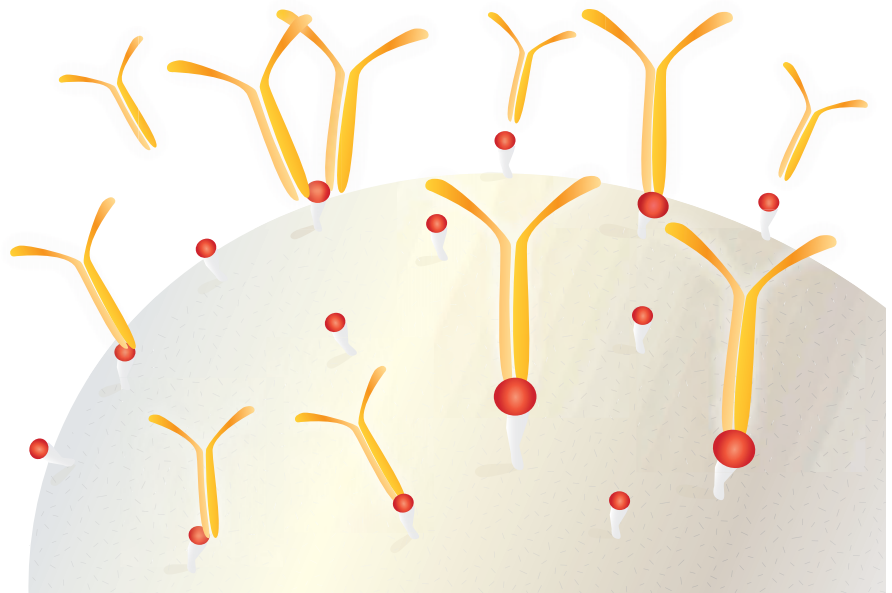
POLYMER MICROSPHERES

Proteins A and G

Protein A and Protein G readily bind the Fc regions of many IgG isotypes. For this reason, they are used extensively for affinity purification of antibodies from serum or cell culture supernatant, and for capture of immunoprecipitated protein complexes. When Protein A and Protein G microspheres are used as reagents in tests and assays, the immobilized antibodies may be crosslinked to the coated support for long-term stability. You can find our magnetic Protein A and G products on pages 38, 43, and our flow cytometry Protein A & G beads on page 80. See also TN101 and PDS 722 for more information.

| Catalog Number | Description | Nominal Diameter | Specification Range |
|----------------|-------------------|------------------|---------------------|
| CP02000 | Protein A Polymer | 1.00µm | 0.95 - 1.05µm |
| CP02001 | Protein A Polymer | 5.00µm | 4.80 - 5.20µm |
| CP02002 | Protein A Polymer | 10.00µm | 9.50 - 10.50µm |

Protein A polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



| Host Species | Antibody Class | Protein A Affinity Strength | Protein G Affinity Strength |
|--------------|-------------------|-----------------------------|-----------------------------|
| Mouse | Total IgG | Strong | Strong |
| | IgG ₁ | Weak | Medium |
| | IgG _{2a} | Strong | Strong |
| | IgG _{2b} | Strong | Strong |
| Rat | Total IgG | Weak | Medium |
| | IgG ₁ | Weak | Medium |
| | IgG _{2a} | No Binding | Strong |
| | IgG _{2b} | No Binding | Weak |
| | IgG _{2c} | Strong | Strong |
| Human | Total IgG | Strong | Strong |
| | IgG ₁ | Strong | Strong |
| | IgG ₂ | Strong | Strong |
| | IgG ₃ | Weak | Strong |
| | IgG ₄ | Strong | Strong |
| Goat | Total IgG | Weak | Strong |
| | IgG ₁ | Weak | Strong |
| | IgG ₂ | Strong | Strong |
| Rabbit | Total IgG | Strong | Strong |
| Hamster | Total IgG | Weak | Medium |
| Sheep | Total IgG | Weak | Strong |
| | IgG ₁ | Weak | Strong |
| | IgG ₂ | Strong | Strong |
| Guinea Pig | Total IgG | Strong | Weak |
| Donkey | Total IgG | Medium | Strong |

Additional Products

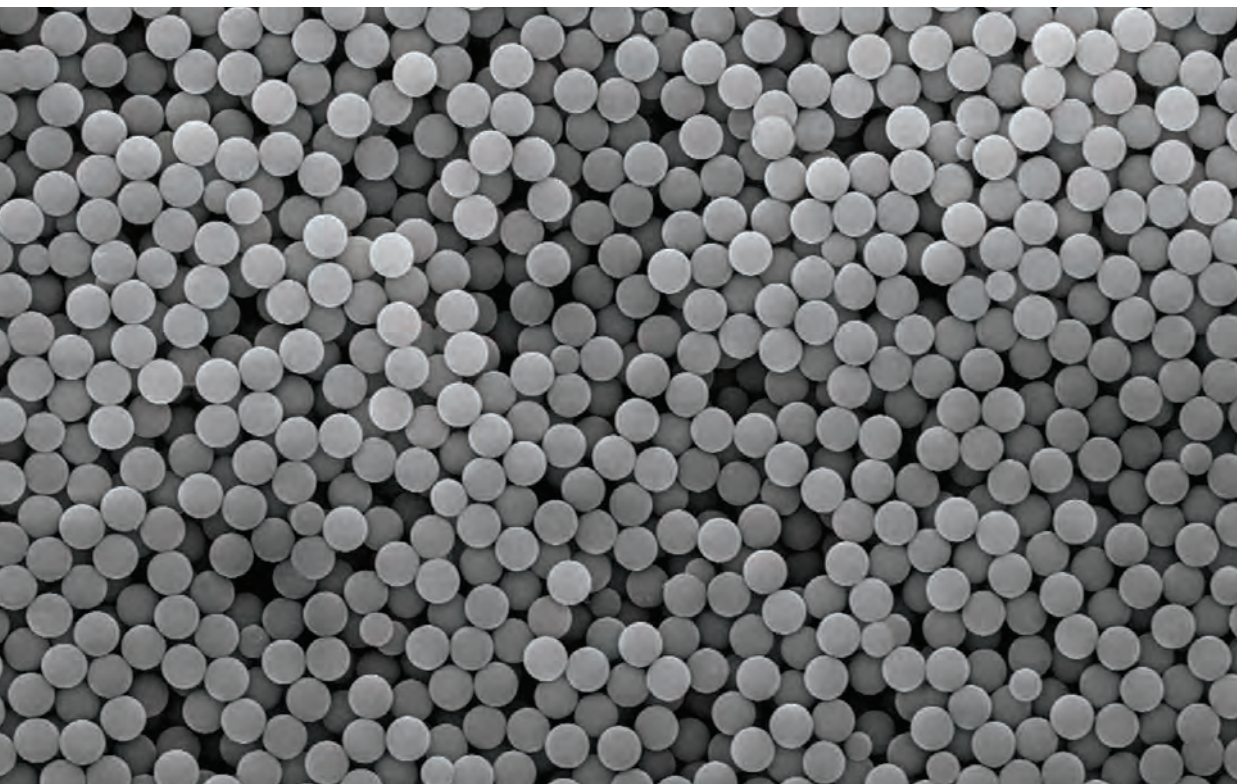
Our line of BioMag® superparamagnetic particles includes many affinity coatings, such as streptavidin, biotin, Protein A, Protein G, oligo dT, wheat germ agglutinin (WGA), Concanavalin A (Con A), and a range of secondary antibodies (pages 42 - 45).

SILICA MICROSPHERES

Inorganic supports such as silica microspheres have become increasingly important for a variety of applications, including isolation of nucleic acids, cell separation, and immuno- and DNA-based assays. The unique properties of a silica substrate offer benefits such as flexible silanization chemistries, unique refractive index and density, low autofluorescence, low nonspecific binding of proteins, hydrophilicity & ease of handling.

| Silica Properties | |
|---|---|
| Surface Functionalities | SiOH (plain), COOH, NH ₂ , SA, Bind-IT |
| Refractive Index (589nm) | ~1.43 – 1.46 |
| Density (g/cm³) | ~2.0 |
| Glass Transition Temperature (°C)* | >>1000 |

* Reported value for bulk silica.



Plain Silica

SiO₂ with natural hydroxyl or silanol (SiOH) surface groups that are available for silanization. See TN104 and PDS 702.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| SS02000 | 0.150µm | 0.120 - 0.180µm |
| SS02001 | 0.300µm | 0.260 - 0.340µm |
| SS02002 | 0.400µm | 0.360 - 0.440µm |
| SS03000 | 0.500µm | 0.460 - 0.540µm |
| SS03001 | 0.700µm | 0.660 - 0.740µm |
| SS03002 | 0.900µm | 0.860 - 0.940µm |
| SS04000 | 1.00µm | 0.95 - 1.05µm |
| SS04001 | 1.50µm | 1.40 - 1.60µm |
| SS04002 | 2.00µm | 1.80 - 2.20µm |
| SS05000 | 2.50µm | 2.30 - 2.70µm |
| SS05001 | 3.00µm | 2.80 - 3.20µm |
| SS05002 | 4.00µm | 3.80 - 4.20µm |
| SS05003 | 5.00µm | 4.80 - 5.20µm |
| SS06000 | >5.00µm | >5.00µm |

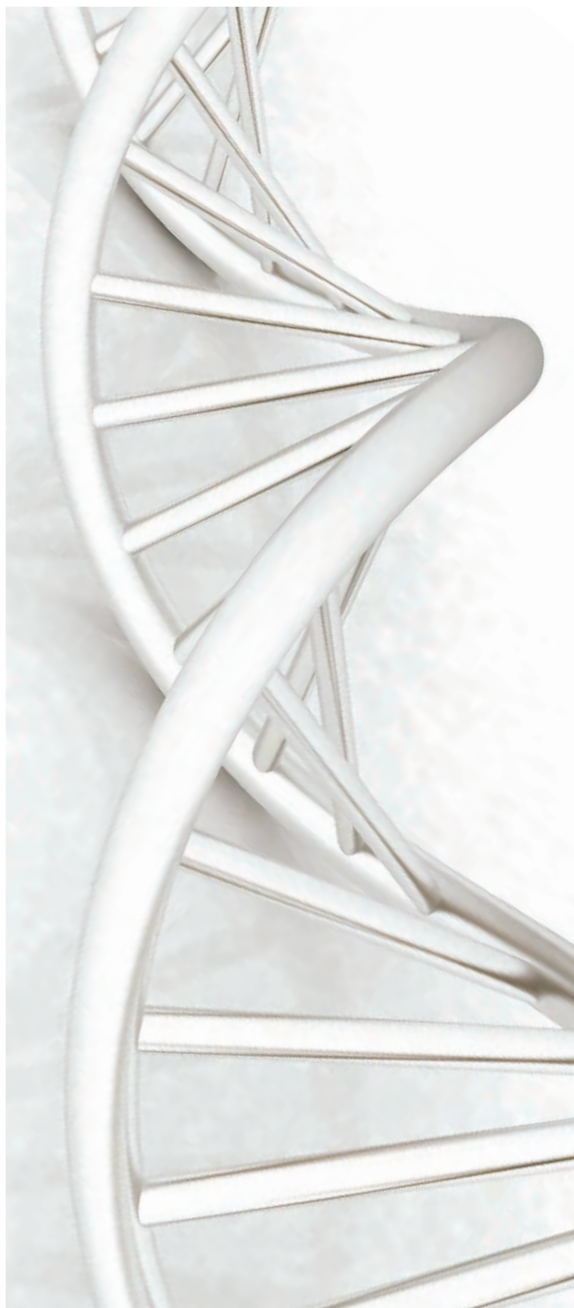
Plain silica comes in weights of 0.5, 1.0, 1.5, or 5.0 grams. (~10% solids 100 mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Plain Silica in Dry Form

SiO₂ with natural hydroxyl or silanol (SiOH) surface groups that are available for silanization. See TN104 and PDS 702.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| SSD2001 | 0.300µm | 0.260 - 0.340µm |
| SSD3000 | 0.500µm | 0.460 - 0.540µm |
| SSD4000 | 1.00µm | 0.95 - 1.05µm |
| SSD4001 | 1.50µm | 1.40 - 1.60µm |
| SSD5000 | 2.50µm | 2.30 - 2.70µm |
| SSD5001 | 3.00µm | 2.80 - 3.20µm |
| SSD5002 | 4.00µm | 3.80 - 4.20µm |
| SSD5003 | 5.00µm | 4.80 - 5.20µm |

Plain dry silica comes in weights of 0.5, 1.0, 1.5, or 5.0 grams. Please see BangsLabs.com for pricing or contact a local agent.



SILICA MICROSPHERES

Carboxyl Silica

SiO₂ with carboxyl (COOH) surface groups for the covalent attachment of biomolecules, supplied dry. See PDS 702.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| SC03000 | 0.500µm | 0.460 - 0.540µm |
| SC04000 | 1.00µm | 0.95 - 1.05µm |
| SC05000 | 2.00µm | 2.80 - 2.20µm |
| SC05001 | 5.00µm | 4.80 - 5.20µm |

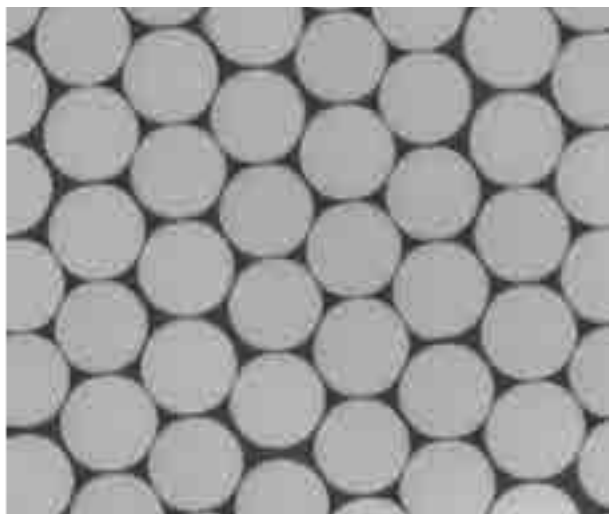
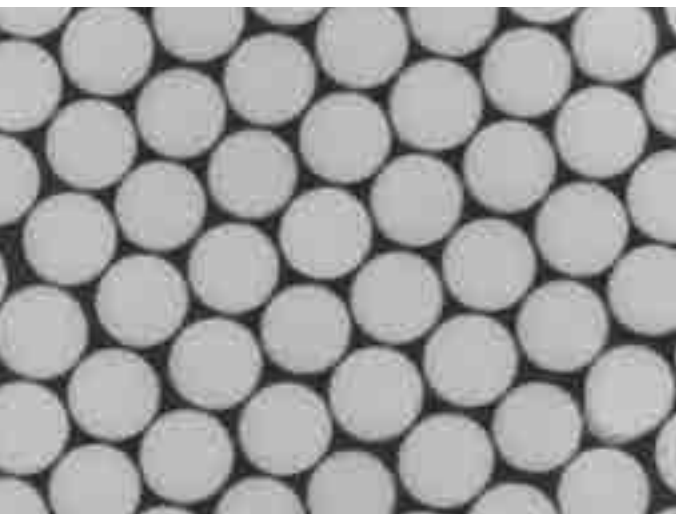
Carboxyl silica unit size is 1.0 gram. Please see BangsLabs.com for pricing or contact a local agent.

Amine Silica

SiO₂ with amine (NH₂) surface groups for the covalent attachment of biomolecules, supplied dry. See PDS 702.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| SA03000 | 0.500µm | 0.460 - 0.540µm |
| SA04000 | 1.00µm | 0.95 - 1.05µm |
| SA05000 | 5.00µm | 4.80 - 5.20µm |

Amine silica unit size is 1.0 gram. Please see BangsLabs.com for pricing or contact a local agent.



Streptavidin Coated Silica

SiO₂ with a streptavidin coating for the attachment of biotinylated molecules, supplied at 1% solids (10mg/mL). See TN101 and PDS 702.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| CS01000 | 0.500µm | 0.460 - 0.540µm |
| CS01001 | 1.00µm | 0.95 - 1.05µm |
| CS01002 | 5.00µm | 4.80 - 5.20µm |

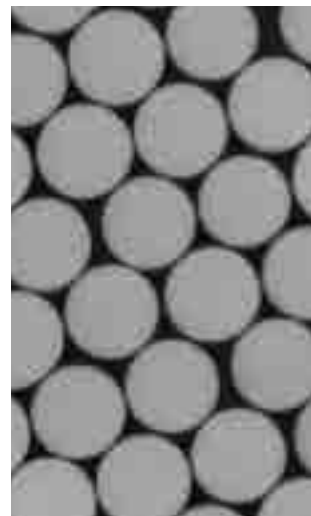
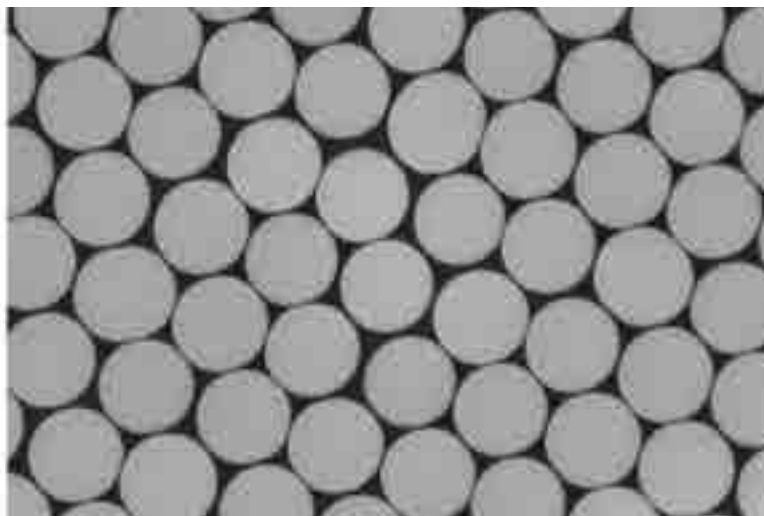
Streptavidin coated silica comes in volumes of 1mL, 2mL, 5mL, or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Silica Bind-IT™

Silica Bind-IT™ are pure SiO₂ with a pre-activated surface that allows ready binding of antibody without sacrificing stability. Provided at 2.5% solids (25mg/mL) in two nominal diameters, 1µm and 5µm. See PDS 737.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| SB04000 | 1.00µm | 0.95 - 1.05µm |
| SB06000 | 5.00µm | 4.80 - 5.20µm |

Silica Bind-IT comes in volumes of 2mL, 5mL, or 10mL. (~2.5% solids 25mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



MAGNETIC MICROSPHERES & PARTICLES

Superparamagnetic particles have been utilized extensively in diagnostic and other research applications for the capture of biomolecules and cells. They confer a number of benefits, including ease of separation and suitability for automation. Magnetic particle-based diagnostic assays demand the highest performance in terms of physical handling, ligand binding characteristics, and signal-to-noise ratios. Bead composition directly impacts settling and magnetic separation profiles, which have implications for assay parameters such as incubation times for binding and elution steps, buffer changes, etc. Most importantly, the composition impacts specific / nonspecific binding characteristics, and background signal arising from the particle itself. These factors have a direct impact on the sensitivity and dynamic range of the assay.

Our comprehensive magnetic particle offerings allow us to address the unique requirements of specific assay systems, with options for particle diameter, morphology, surface properties, separation profile, and other characteristics. No other company offers such a complete collection for your screening and development efforts. We synthesize at scales that will carry you from R&D through manufacturing, and under an ISO 13485 Quality System that will meet your regulatory needs. We invite you to explore the vast technical resources on our website, or to contact us directly to discuss your next development project.

| Assay | |
|-------------------|--|
| Chemiluminescence | ProMag® HP |
| Immuno | ProMag®, ProMag®HP, COMPEL™, or BioMag® |
| Molecular | Magnefy™, ProMag®, ProMag® HP or COMPEL™ |
| Flow cytometric | COMPEL™ |

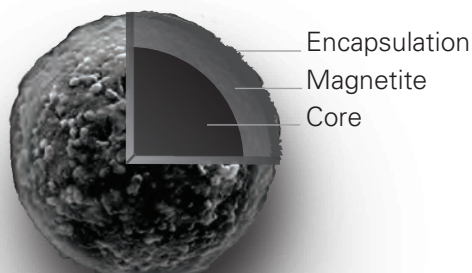
See Magnetic Separators, page 52 - 54 or our Magnetic Beads for Assay Development Brochure from BangsLabs.com.



Magnetic Separation

Magnefy™

Meet the newest addition to our family of magnetic particles—Magnefy™ ~1µm carboxylated superparamagnetic microspheres. As high surface area / high surface titer microparticles with a rapid separation profile, Magnefy offer an additional performance-driven solid phase for magnetic particle-based assays and isolations. See PDS 756.

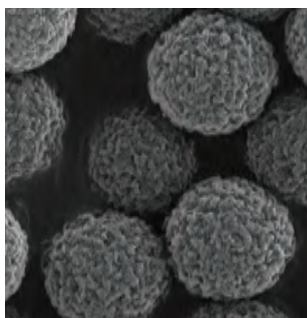


| Catalog Number | Description | Nominal Diameter | Unit size |
|----------------|---------------|------------------|------------------------|
| MFY0001 | Magnefy™ COOH | 1µm | 5mL, 10mL, 25mL, 100mL |

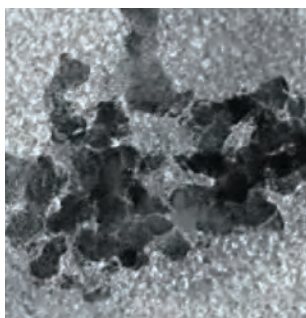
(~5% solids 50mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Magnetic Particle Sampler Packs

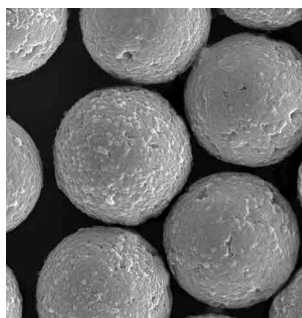
For development efforts, our Magnetic Particle Sampler Packs allow you to test different particles to find which yield optimal performance characteristics in your specific system. Choose from carboxylated or streptavidin coated versions. See PDS 749.



ProMag



BioMag



ProMag HP

COOH Magnetic Sample Pack Includes:

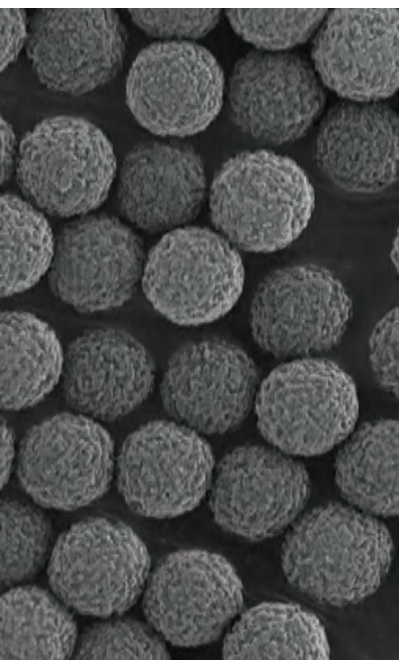
| Catalog Number | Description |
|----------------|---|
| 21940 | PMC1N - ProMag® 1 Series • COOH - 5mL (2.5% solids) |
| | PMC3HP - ProMag® 3 HP • COOH - 5mL (2.5% solids) |
| | BP618 - BioMag®Plus • COOH - 5mL (20mg / mL) |

Streptavidin Magnetic Sample Pack Includes:

| Catalog Number | Description |
|----------------|---|
| 21950 | PMS1N - ProMag® 1 Series • Streptavidin - 1mL (1% solids) |
| | PMS3HP - ProMag® 3 HP • Streptavidin - 1mL (1% solids) |
| | BP628 - BioMag®Plus • Streptavidin - 2mL (5mg / mL) |

Please see BangsLabs.com for pricing or contact a local agent.

MAGNETIC MICROSPHERES & PARTICLES

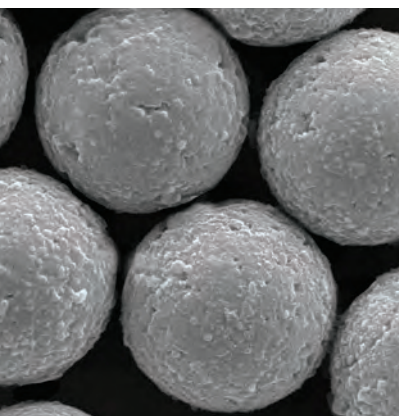


ProMag®

ProMag are highly uniform 1µm and 3µm polymer-based magnetic spheres. A unique surface means low nonspecific binding in protein-based systems, and superior handling without the use of surfactant. These high-binding particles are suitable for use across a range of research and diagnostic applications. ProMag offer rapid and uniform separations that are particularly important to automated assays. See PDS 715 and 735.

| Catalog Number | Description | Nominal Diameter | Unit size |
|----------------|-----------------------------------|------------------|------------------------|
| PMC1N | ProMag 1 Series • COOH | 1µm | 5mL or 25mL |
| PMC3N | ProMag 3 Series • COOH | 3µm | 5mL or 25mL |
| PMA3N | ProMag 3 Series • NH ₂ | 3µm | 5mL or 25mL |
| PMS1N | ProMag 1 Series • Streptavidin | 1µm | 1mL, 2mL, 5mL, or 10mL |
| PMS3N | ProMag 3 Series • Streptavidin | 3µm | 1mL, 2mL, 5mL, or 10mL |
| PMB3N | ProMag 3 Series • Bind-IT™ | 3µm | 2mL, 5mL, or 10mL |
| PMG3N | ProMag 3 Series • Protein G | 3µm | 1mL, 2mL, 5mL, or 10mL |

(COOH, NH₂ & Bind-IT, ~2.5% solids 25mg/mL) (SA & Protien G ~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



ProMag® HP

ProMag HP (High Performance) have been meticulously engineered for use in assay development. The highly optimized composition ensures lowest autosignal, particularly with respect to chemiluminescence and exposed iron. See PDS 743.

| Catalog Number | Description | Nominal Diameter | Unit size |
|----------------|-----------------------------------|------------------|------------------------|
| PMC3HP | ProMag HP 3 Series • COOH | 3µm | 5mL or 25mL |
| PMS3HP | ProMag HP 3 Series • Streptavidin | 3µm | 1mL, 2mL, 5mL, or 10mL |

(COOH ~2.5% solids 25mg/mL) (SA ~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

COMPEL™

COMPEL are highly uniform superparamagnetic microspheres ideal for applications that demand uniform particle response, such as miniaturized bioassays and separations. COMPEL are comprised of iron oxide crystals dispersed in a polymer matrix, with a functional polymer overcoating for encapsulation of magnetite and introduction of reactive groups. As they are polymer-based, they retain the low density that is advantageous for biomolecular assays. See QuantumPlex M, page 27, for our suspensions array platform based on COMPEL.

| Parameter | Description |
|-------------------------------|-------------------------------|
| Composition | Magnetite in a polymer matrix |
| Morphology | Spherical |
| Surface Functionalities | COOH, SA |
| Density (g/cm ³)* | ~1.1 – 1.2 |
| Iron Oxide Content (%)* | ~2.4 – 12.0 |

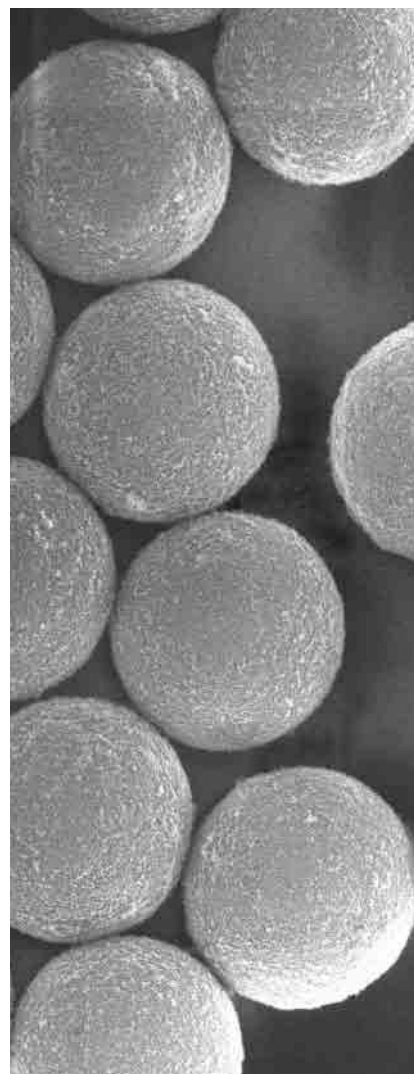
* Diameter dependent

COMPEL™ Carboxyl

COMPEL Carboxyl may be coated using traditional EDAC-based chemistry, such as that featured in our PolyLink Protein Coupling Kit (page 46). See also PDS 705.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| UMC3001 | 3µm | 2.50 - 3.50µm |
| UMC3002 | 6µm | 5.50 - 6.50µm |
| UMC4001 | 8µm | 7.50 - 8.50µm |

Carboxyl COMPEL comes in units of 0.5g, 1g, 1.5g or 5g (~5% solids 50mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



MAGNETIC MICROSPHERES & PARTICLES

COMPEL™ Streptavidin

Streptavidin-coated COMPEL offer the combined ease of affinity binding and magnetic separation. See PDS 721.

| Catalog Number | Nominal Diameter | Specification Range |
|----------------|------------------|---------------------|
| UMC0100 | 3µm | 2.50 - 3.50µm |
| UMC0101 | 6µm | 5.50 - 6.50µm |
| UMC0102 | 8µm | 7.50 - 8.50µm |

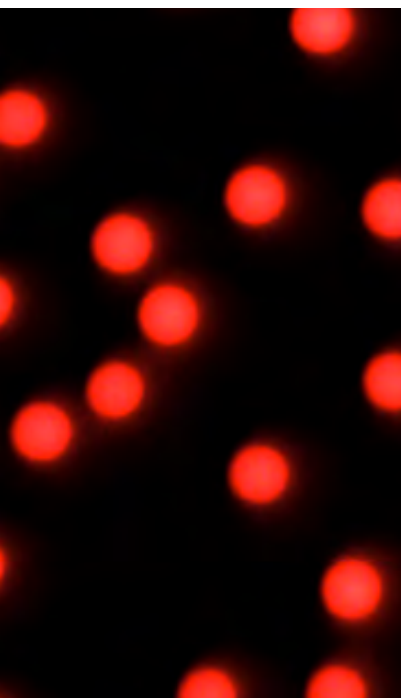
Streptavidin coated COMPEL come in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL)
Please see BangsLabs.com for pricing or contact a local agent.

COMPEL™ Fluorescent

As COMPEL spheres are polymer-based, we are able to use them to make bright internally-dyed microsphere standards. Fluorophores include Glacial Blue (360, 450), Dragon Green (480, 520), Envy Green (525,565), and Flash Red (660, 690). See pages 20-21 for spectra. See PDS 705.

| Catalog Number | Fluorescence Color | Nominal Diameter | Specification Range |
|----------------|--------------------|------------------|---------------------|
| UMGB001 | Glacial Blue | 3µm | 2.50 - 3.50µm |
| UMDG001 | Dragon Green | 3µm | 2.50 - 3.50µm |
| UMEG001 | Envy Green | 3µm | 2.50 - 3.50µm |
| UMFR001 | Flash Red | 3µm | 2.50 - 3.50µm |
| UMGB002 | Glacial Blue | 6µm | 5.50 - 6.50µm |
| UMDG002 | Dragon Green | 6µm | 5.50 - 6.50µm |
| UMFR002 | Flash Red | 6µm | 5.50 - 6.50µm |
| UMGB003 | Glacial Blue | 8µm | 7.50 - 8.50µm |
| UMDG003 | Dragon Green | 8µm | 7.50 - 8.50µm |
| UMFR003 | Flash Red | 8µm | 7.50 - 8.50µm |

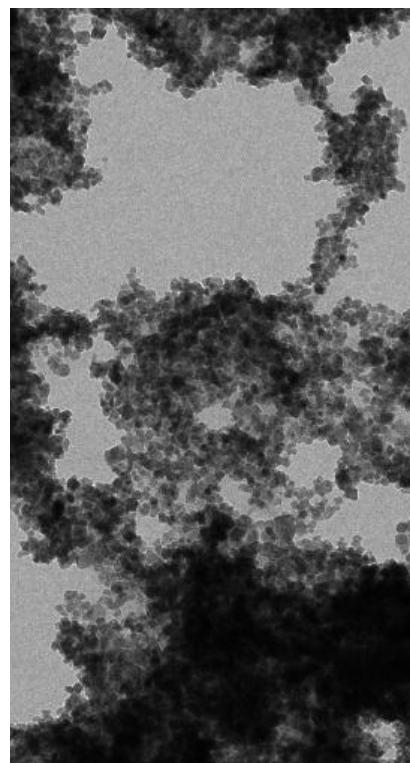
Fluorescent COMPEL come in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL)
Please see BangsLabs.com for pricing or contact a local agent.



BioMag® and BioMag®Plus

BioMag and BioMag Plus are ~1.5µm high-performance superparamagnetic microparticles widely used in assays and for the efficient separation of cells and purification of proteins or other biomolecules. Their irregular morphology provides much greater surface area than similarly-sized spherical particles, resulting in high binding capacities and efficient capture of target with conservative use of particles. The high iron oxide content allows for rapid and efficient magnetic separations, even from difficult, e.g. highly viscous, samples. BioMag Plus particles undergo additional processing for reduction of fines.

| | |
|---------------------------------------|---|
| Composition | Silanized iron oxide |
| Morphology | Cluster, irregular |
| Surface Functionalities | COOH, NH ₂ , streptavidin, antibodies, and other affinity binding proteins |
| Density (g/cm³) | > 2.5 |
| Iron Oxide Content (%) | > 90 |
| Magnetization (emu/g) | ~ 25 – 35 |
| Surface Area (m²/g) | > 100 |
| Particles / mg | ~ 1 x 10 ⁸ |



Functionalized BioMag®

BioMag are offered in carboxyl and amine functionalized versions to support covalent binding strategies. Covalent coatings offer the highest stability and opportunities to tailor the immobilization chemistry using specialized linkers. See website for specific product data sheets.

| Catalog Number | Description | Concentration | Unit size |
|-----------------------|--|----------------------|-----------------------------|
| BM546 | BioMag Amine | 50 mg/mL | 10mL or 100mL |
| BM545 | BioMag Magnetic Amine Immobilization Kit* | 50 mg/mL | 10mL (1 reaction x 10mL) |
| BP617 | BioMag Plus Amine | 50 mg/mL | 10mL or 100mL |
| BP610 | BioMag Plus Amine Protein Coupling Kit* | 50 mg/mL | 10mL (5 reactions x 2mL) |
| BM570 | BioMag Carboxyl | 20 mg/mL | 10mL or 100mL |
| BP618 | BioMag Plus Carboxyl | 20 mg/mL | 10mL |
| BP611 | BioMag Plus Carboxyl Protein Coupling Kit* | 20 mg/mL | 2.5mL (5 reactions x 0.5mL) |

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

MAGNETIC MICROSPHERES & PARTICLES

BioMag® Maxi

BioMag Maxi have the same irregular morphology and composition as standard BioMag products, but with a larger mean diameter of ~3 – 12µm. See PDS 630 and PDS 640.

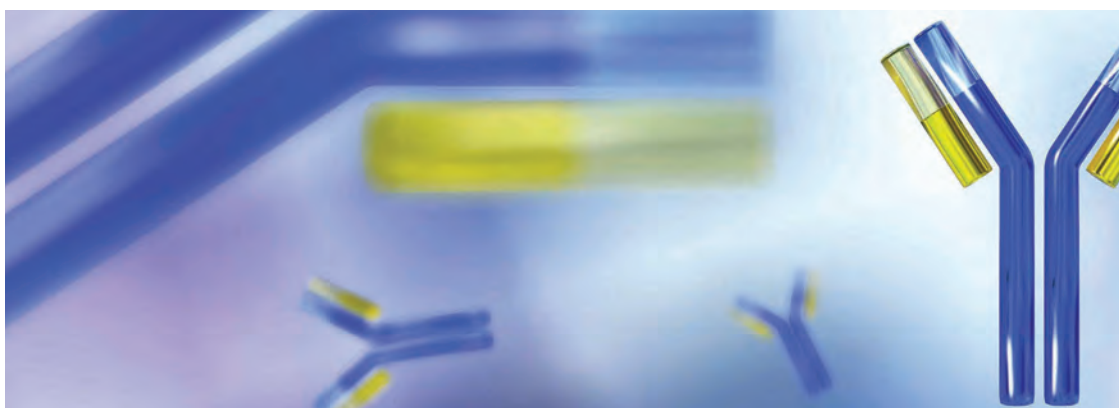
| Catalog Number | Description | Concentration | Unit size |
|----------------|----------------------|---------------|-----------|
| BMM30 | BioMag Maxi Carboxyl | 20 mg/mL | 10mL |
| BMM40 | BioMag Maxi Amine | 50 mg/mL | 10mL |

Please see BangsLabs.com for pricing or contact a local agent.

BioMag® for Affinity Ligand Binding

BioMag particles with affinity binding proteins may be coated with their affinity binding partner through a straightforward incubation. They are also suitable for off-the-shelf use in applications such as immunoprecipitation or PCR product clean-up.

| Ligand | Binding Partner | Strength |
|-----------------------|---|------------------------------|
| Streptavidin | Biotin | 10^{13} |
| Biotin | Streptavidin | 10^{13} |
| Protein A | Fc region of IgG, species and isotype specific | Varies, see chart on page 31 |
| Protein G | Fc region of IgG, species and isotype specific | Varies, see chart on page 31 |
| Concanavalin A | Mannosyl- and glucosyl-containing glycoproteins and polysaccharides | $10^6 - 10^7$ |
| Wheat Germ Agglutinin | N-acetylglucosamine-containing glycoproteins and polysaccharides | $10^3 - 10^7$ |



BioMag® Streptavidin and BioMag® Biotin

The streptavidin / biotin system offers one of the most straightforward and secure non-covalent coating strategies, and is commonly used to bind or capture labeled antibodies, oligonucleotides, peptides, and protein complexes. See website for specific product data sheets.

| Catalog Number | Description | Concentration | Unit size |
|----------------|---|---------------|--------------------|
| BM551 | BioMag Streptavidin | 5 mg/mL | 5mL or 50mL |
| BP628 | BioMag Plus Streptavidin | 5 mg/mL | 10mL |
| BM568 | BioMag Streptavidin, Nuclease-free | 1 mg/mL | 10mL 25mL or 100mL |
| BP621 | BioMag Plus Streptavidin / Biotin Binding Kit* (suitable for various biotinylated molecules) | 5 mg/mL | 5 x 1mL |
| BM552 | BioMag Biotin | 20 mg/mL | 10mL or 100mL |

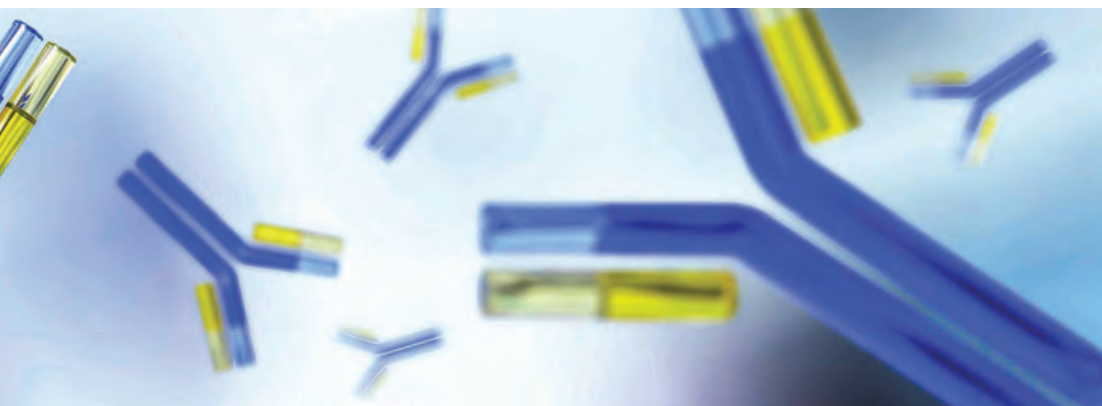
* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag® for Fc-Antibody Binding

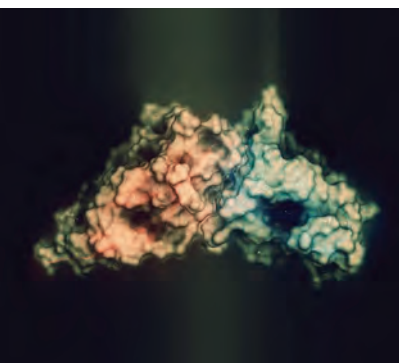
Fc-binding proteins such as Protein A and Protein G offer directed immobilization for a full complement of IgG subclasses from various hosts. They also find routine use for antibody purifications and serum sample preparation. See website for specific product data sheets.

| Catalog Number | Description | Concentration | Unit size |
|----------------|---|---------------|------------------------------|
| BM554 | BioMag Protein A | 5 mg/mL | 2mL or 10mL |
| BP620 | BioMag Plus Protein A | 5 mg/mL | 2mL or 10mL |
| BP614 | BioMag Plus Protein A Antibody Isolation Kit* | 5 mg/mL | 2.5 mL (5 reactions x 0.5mL) |
| BM553 | BioMag Protein G | 5 mg/mL | 2mL or 10mL |
| BP627 | BioMag Plus Protein G | 5 mg/mL | 2mL or 10mL |
| BP626 | BioMag Plus Protein G Antibody Isolation Kit* | 5 mg/mL | 2.5 mL (5 reactions x 0.5mL) |

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.



MAGNETIC MICROSPHERES & PARTICLES

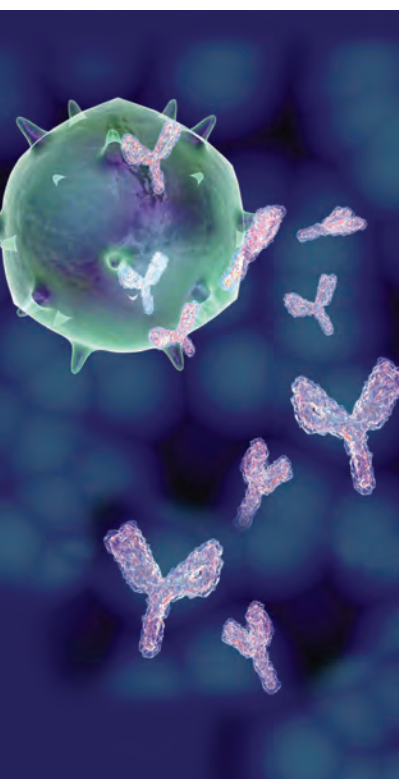


BioMag® Lectin

Lectins including Concanavalin A and Wheat Germ Agglutinin have specific sugar binding partners that can be exploited for the immobilization of saccharides, which commonly lack functional groups needed for covalent binding. See PDS 716 and PDS 720.

| Catalog Number | Description | Concentration | Unit size |
|----------------|-----------------------------------|---------------|-------------|
| BP531 | BioMag Plus Concanavalin A | 5 mg/mL | 3mL or 10mL |
| BP530 | BioMag Plus Wheat Germ Agglutinin | 5 mg/mL | 3mL or 10mL |

Please see BangsLabs.com for pricing or contact a local agent.



BioMag® Secondary Antibody

BioMag secondary antibody particles are used extensively in the capture of immune complexes for immunoprecipitation and antibody-labeled cells for indirect cell separation. Secondary antibody coatings also afford a convenient method for binding specific primary antibodies to BioMag particles. See website for specific product data sheets.

| Catalog Number | Description | Concentration | Unit size |
|----------------|---|---------------|---------------|
| BM563 | BioMag anti-Human IgG | 1 mg/mL | 50mL |
| BM562 | BioMag anti-Human IgG (Fc) | 5 mg/mL | 50mL |
| BM561 | BioMag anti-Human IgM | 1 mg/mL | 50mL |
| BM549 | BioMag anti-Mouse IgG | 1 mg/mL | 50mL or 500mL |
| BM550 | BioMag anti-Mouse IgG (Fc) | 5 mg/mL | 50mL or 500mL |
| BP619 | BioMag Plus anti-Mouse IgG | 1 mg/mL | 50mL |
| BP612 | BioMag Plus anti-Mouse IgG Antibody Coupling Kit* | 1 mg/mL | 25mL |
| BM558 | BioMag anti-Mouse IgM | 1 mg/mL | 50mL or 500mL |
| BM559 | BioMag anti-Rabbit IgG | 1 mg/mL | 50mL or 500mL |
| BM560 | BioMag anti-Rat IgG | 1 mg/mL | 50mL or 500mL |
| BM548 | BioMag anti-Rat IgG (Fc) | 5 mg/mL | 50mL or 500mL |
| BM557 | BioMag anti-Rat IgM | 5 mg/mL | 50mL or 500mL |

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Dextran-Coated Charcoal

BioMag Dextran-coated Charcoal is suitable for the adsorption of free tritium-labeled analyte in typical competitive radioimmunoassays. BioMag particles are coated with NORIT® activated carbon and dextran. See PDS 555.

| Catalog Number | Description | Concentration | Unit size |
|----------------|--|---------------|-----------|
| BM555 | BioMag Dextran-coated Charcoal | 5 mg/mL | 100mL |
| BP530 | BioMag Dextran-coated Charcoal Concentrate | 50 mg/mL | 1000mL |

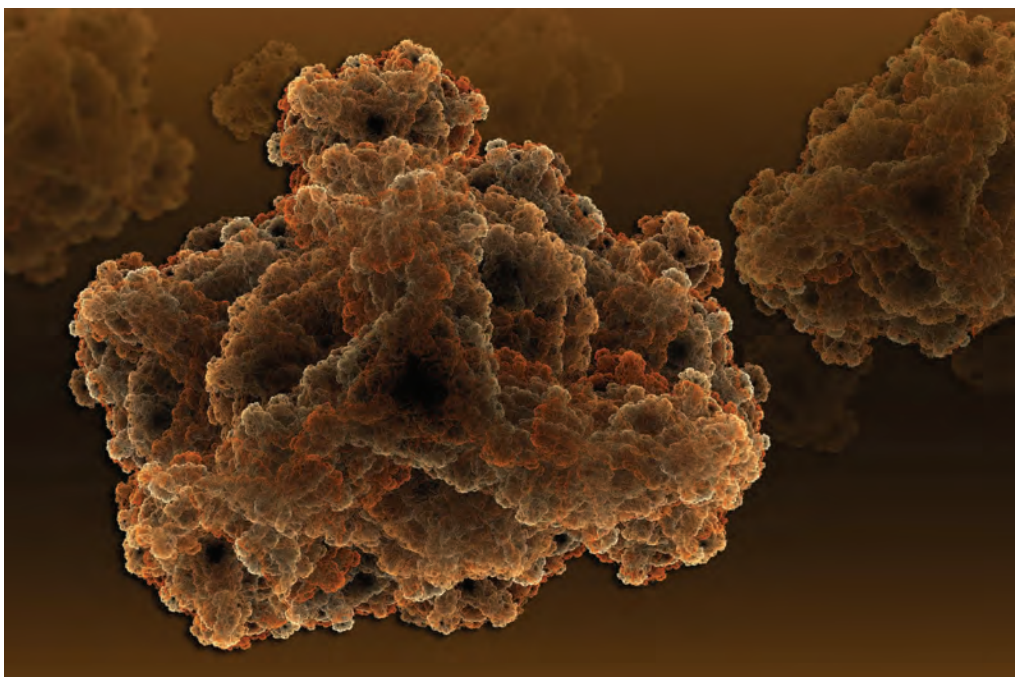
Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Superparamagnetic Iron Oxide

BioMag Superparamagnetic Iron Oxide may be used for applications in which a plain iron oxide particle is required. Particles are ~10µm in size, and are non-functionalized. See PDS 547.

| Catalog Number | Description | Concentration | Unit size |
|----------------|-------------------------------------|---------------|-----------|
| BM547 | BioMag Superparamagnetic Iron Oxide | 50 mg/mL | 10mL |

Please see BangsLabs.com for pricing or contact a local agent.



ACCESSORY REAGENTS & COMPANION PRODUCTS

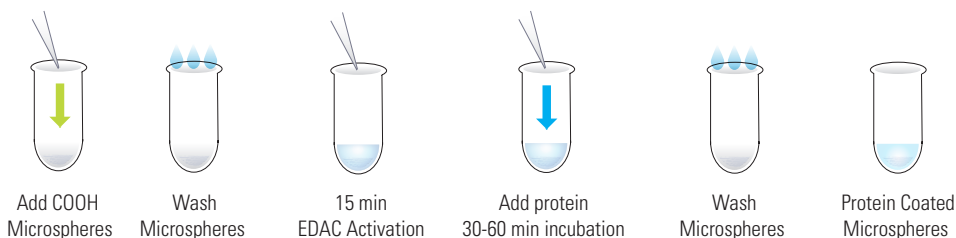
Whether you're just getting started, or are an established laboratory seeking convenience, we have assembled a collection of useful accessory products and implements to assist with your microparticle reagent development and handling efforts. Our offerings include common crosslinking reagents, surfactants, and solutions / buffers for microsphere coating and storage. Our magnetic particle separators and ultrafiltration devices support microparticle washing protocols (see TN 203), while our laboratory rotisserie offers a gentle mixing method for suspension preparation and coating protocol incubations. These products complement our extensive catalog of polymer, silica, and magnetic microparticles, and we hope you find them to be helpful.

COUPLING KITS

Our coupling kits permit the covalent immobilization of proteins to microparticles. We offer several kits featuring BioMag® superparamagnetic particles and separations, as well as PolyLink, which may be used with carboxylated polymer or silica microspheres of your choosing. See associated PDS' for protocols and full kits details. See TN205, Covalent Coupling.

PolyLink Protein Coupling Kit

Our PolyLink Protein Coupling Kit is ideal for investigators who are new to microsphere coating, or simply desire the convenience of a kit. The kit is intended for use with carboxyl-functionalized microspheres of 1µm or larger. It contains sufficient EDAC, coupling buffer, and wash / storage buffer for 50 reactions using ~200 – 500µg protein and 12.5mg COOH-functionalized microspheres per reaction. The protocol may be adapted for smaller or larger diameter spheres and our Vivaspin® ultrafiltration devices may be used for wash steps with submicron spheres. See PDS 644.



| Catalog Number | Description | # of Reactions |
|----------------|--------------------------------|---------------------------|
| PL01N | PolyLink Protein Coupling Kit* | 50 x 12.5mg microspheres* |

* Microspheres and protein are not included in the kit. Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Magnetic Immobilization Kit

The BioMag Magnetic Immobilization Kit is designed to introduce the user to particle coating using BioMag Amine particles and glutaraldehyde. The kit contains sufficient reagents for 1 x 10mL coupling reaction. See PDS 546.

| Catalog Number | Description | Concentration | Unit size |
|----------------|---|---------------|-------------------------|
| BM545 | BioMag Amine Magnetic Immobilization Kit* | 50 mg/mL | 10mL (1 reaction x10mL) |

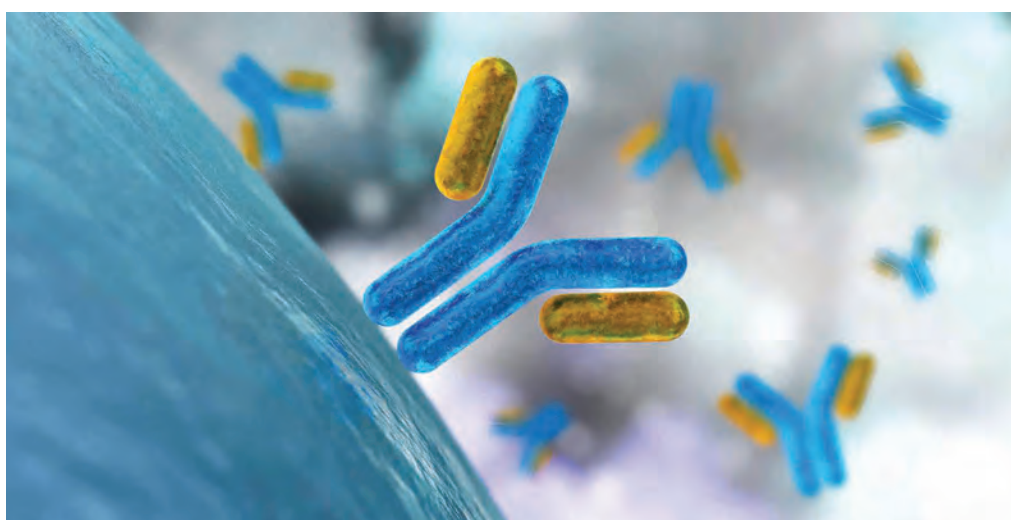
* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag®Plus Protein Coupling Kits

The BioMag Plus Protein Coupling Kits are intended for the covalent coupling of proteins to BioMag Plus superparamagnetic particles. The Protein Coupling Kits feature either BioMag Plus Amine or BioMag Plus Carboxyl particles, a chemical crosslinker (glutaraldehyde or EDAC), conical centrifuge tubes, two wash buffers, the quenching solution, and a BioMag MultiSep Magnetic Separator. See PDS 617 and 618.

| Catalog Number | Description | Concentration | Unit size |
|----------------|--|---------------|-----------------------------|
| BP610 | BioMag Plus Amine Protein Coupling Kit* | 50 mg/mL | 10mL (5 reactions x 2mL) |
| BP611 | BioMag Plus Carboxyl Protein Coupling Kit* | 20 mg/mL | 2.5mL (5 reactions x 0.5mL) |

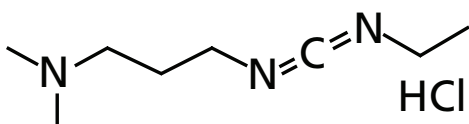
* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.



ACCESSORY REAGENTS & COMPANION PRODUCTS

COUPLING REAGENTS

Our crosslinking reagents for microsphere coating offer a convenient means to replenish individual components of coupling kits. See PDS 740.

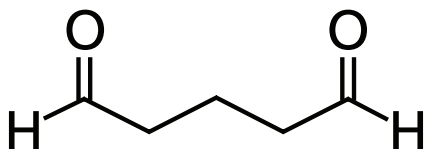


DEPC-Carbodiimide (EDAC)

EDAC is a zero-length crosslinker that is routinely used for the covalent binding of amine-containing ligands to carboxylated microspheres. Sample protocols are provided in TN 205, Covalent Coupling, 302, Molecular Biology, and PolyLink PDS 644.

| Catalog Number | Description | Unit size |
|----------------|--------------------------|-----------|
| AA010 | DEPC-Carbodiimide (EDAC) | 1g or 5g |

Please see BangsLabs.com for pricing or contact a local agent.



Glutaraldehyde, EM Grade, 25%

Glutaraldehyde is a homobifunctional linker that is suitable for binding amine-containing ligands to amine-modified beads. We supply EM (electron microscopy) grade glutaraldehyde in ampoules to ensure highest activity. Each vial is fitted with an ampoule cracker for added safety.

| Catalog Number | Description | Unit size |
|----------------|-------------------------------|-----------------------|
| AA012 | Glutaraldehyde, EM Grade, 25% | 10 x 10 mL (ampoules) |

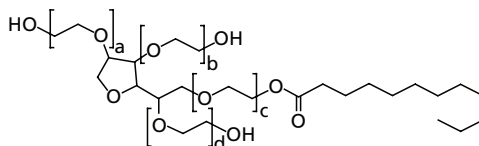
Please see BangsLabs.com for pricing or contact a local agent.

SURFACTANTS

Surfactants are commonly utilized with microspheres composed of hydrophobic polymer matrices such as polystyrene to facilitate bead wetting and deter or treat aggregation. Common concentrations are ~0.1% for uncoated polymer beads, and ~0.01 - 0.05% in the storage buffer of coated polymer, magnetic, and silica beads. The type and concentration of surfactant should be optimized to achieve best performance. As surfactant associates with the bead surface, it is washed out prior to bead coating or use of the coated microsphere reagent to avoid interference with binding reactions. See PDS 739.

Tween® 20 Nonionic Surfactant

Tween® 20 is a nonionic surfactant. It is often used in the storage buffers of coated bead suspensions (~0.01 - 0.05%). Very low concentrations may be used in wash or binding buffers if needed (e.g. 0.0005%).

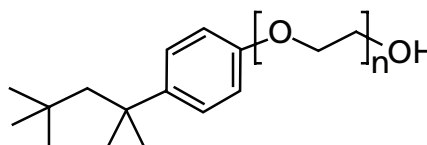


| Catalog Number | Description | Unit size |
|----------------|-------------|-----------|
| AA016 | Tween® 20 | 10g |

Please see BangsLabs.com for pricing or contact a local agent.

Triton™ X-100 Nonionic Surfactant

Triton™ X-100 is a nonionic surfactant. It is often used in the storage buffers of coated bead suspensions (~0.01 - 0.05%). Very low concentrations may be used in wash or binding buffers if needed (e.g. 0.0005%).

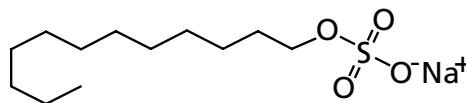


| Catalog Number | Description | Unit size |
|----------------|---------------|-----------|
| AA014 | Triton™ X-100 | 10g |

Please see BangsLabs.com for pricing or contact a local agent.

Sodium Dodecyl Sulfate (SDS) Anionic Surfactant

Sodium dodecyl sulfate (SDS) is an anionic surfactant, which will decrease polymer bead hydrophobicity and can additionally participate in charge stabilization of the suspension. SDS is a more rigorous surfactant that is commonly used in uncoated polymer bead preparations. (~0.1%)



| Catalog Number | Description | Unit size |
|----------------|-------------|-----------|
| AA018 | SDS | 10g |

Please see BangsLabs.com for pricing or contact a local agent.

ACCESSORY REAGENTS & COMPANION PRODUCTS

BUFFERS AND SOLUTIONS

Bangs Bead Solution

Bangs Bead Solution is a ready-to-use aqueous suspending solution for the dilution and / or storage of your uncoated plain, dyed, or functionalized polymer or magnetic microspheres. An antimicrobial agent deters microbial contamination, and stabilizers promote dispersity. See PDS 738.

| Catalog Number | Description | Unit size |
|----------------|---------------------|--------------------------|
| SOLN1 | Bangs Bead Solution | 500mL, 1000mL, or 2000mL |

Please see BangsLabs.com for pricing or contact a local agent.

Bangs Bead Coupling Buffers

Bangs Bead Coupling Buffers are ready-to-use buffers that are available in a variety of pH levels (4.5 to 9.0). They can be used as coupling or wash buffers for polymer, silica, or magnetic microspheres. See PDS 738.

| Catalog Number | Description | pH | Unit size |
|----------------|----------------------------|-----|--------------------------------|
| BUFF1 | Bangs Bead Coupling Buffer | 4.5 | 250mL, 500mL, 1000mL or 2000mL |
| BUFF2 | Bangs Bead Coupling Buffer | 6.0 | 250mL, 500mL, 1000mL or 2000mL |
| BUFF3 | Bangs Bead Coupling Buffer | 7.4 | 250mL, 500mL, 1000mL or 2000mL |
| BUFF4 | Bangs Bead Coupling Buffer | 9.0 | 250mL, 500mL, 1000mL or 2000mL |

Please see BangsLabs.com for pricing or contact a local agent.



Bangs Bead Storage Buffers

Our storage buffers are available in two pH levels: 7.4 and 8.5, and contain stabilizers for long-term stability of coated bead suspensions. See PDS 738.

| Catalog Number | Description | pH | Unit size |
|----------------|---------------------------|-----|--------------------------------|
| BUFF5 | Bangs Bead Storage Buffer | 7.4 | 250mL, 500mL, 1000mL or 2000mL |
| BUFF6 | Bangs Bead Storage Buffer | 8.5 | 250mL, 500mL, 1000mL or 2000mL |

Please see BangsLabs.com for pricing or contact a local agent.

STAINS

Trypan Blue

Trypan blue exclusion is a common method for the determination of cell viability. It is used extensively in biopharmaceutical cell culture programs, and for a range of research studies including apoptosis, cytopathic effects of viral infection, and effects of sample processing methods on cell viability and concentration. Our trypan blue solution is suitable for traditional manual staining and hemocytometer counting. See PDS 748.

| Catalog Number | Description | Unit size |
|----------------|---------------------------|-----------|
| AA020 | Trypan Blue 0.4% Solution | 125mL |
| AA021 | Trypan Blue 0.4% Solution | 250mL |

Please see BangsLabs.com for pricing or contact a local agent.



EQUIPMENT

MAGNETIC SEPARATORS

Superparamagnetic particles have been utilized extensively in diagnostics and other research applications for the isolation of cells and biomolecules such as antibodies, nucleic acids, and polypeptides. The biomagnetic separators available from Bangs Laboratories accommodate a complete range of magnetic separation applications, including cell sorting, mRNA and DNA isolation, and the purification of biomolecules.

Our biomagnetic separators feature high-energy neodymium-iron-boron [Nd-Fe-B] magnets that ensure fast separation rates, excellent wall or well retention, and maximum yield. They are suitable for use with all of our magnetic microparticle product lines.

**1.5mL Magnetic Separator**

The 1.5mL Magnetic Separator is a durable plastic magnetic separation unit designed to accommodate a standard 1.5mL microcentrifuge tube for research scale magnetic separations. Upon placement of the tube on the separator, the magnet will quickly draw superparamagnetic particles to the wall of the tube and out of the solution. Once separation is complete, with particles held firmly to the wall, the supernatant may be removed. The 1.5mL Magnetic Separator is simple and easy to use with most established bead protocols. See PDS 700.

| Catalog Number | Description | Capacity |
|----------------|--------------------------|--------------------------------|
| LS001 | 1.5mL Magnetic Separator | 1 – 1.5mL microcentrifuge tube |

Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Multi-6 Microcentrifuge Tube Separator

The BioMag Multi-6 Microcentrifuge Tube Separator is a durable plastic magnetic separation unit designed to accommodate six 1.5mL microcentrifuge tubes. The magnets and tube holders are positioned to efficiently separate particles from microliter volumes common in molecular biology applications. See PDS 576.

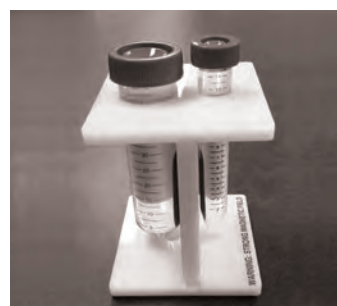


| Catalog Number | Description | Capacity |
|----------------|---|-------------------------------------|
| MS002 | BioMag Multi-6 Microcentrifuge Tube Separator | 6 x 1 – 1.5mL microcentrifuge tubes |

Please see BangsLabs.com for pricing or contact a local agent.

BioMag® MultiSep Magnetic Separator

One magnetic separator that can be used for different tube sizes is a convenient and economical alternative to having a specific magnetic separator for each tube size. The MultiSep can be used with 50mL, 15mL, or 1.5mL centrifuge tubes and has a simple robust design. The MultiSep is well suited for those labs that do not need to perform simultaneous magnetic particle separations. See PDS 598.

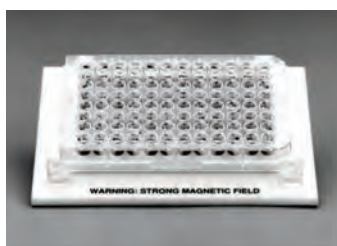


| Catalog Number | Description | Capacity |
|----------------|---------------------------|---------------------------------------|
| MS001 | BioMag MultiSep Separator | 1.5mL, 15mL, or 50mL centrifuge tubes |

Please see BangsLabs.com for pricing or contact a local agent.

BioMag® 96-Well Plate Separator

The BioMag 96-Well Plate Separator (bottom pull) is a durable magnetic separation unit designed to accommodate most 96-well plates. The magnetic separator consists of permanent magnets enclosed in a plastic frame. See PDS 575.



| Catalog Number | Description | Capacity |
|----------------|--------------------------------|-----------------------------|
| MS003 | BioMag 96-Well Plate Separator | 96-well plate (bottom pull) |

Please see BangsLabs.com for pricing or contact a local agent.

EQUIPMENT



BioMag® 96-Well Plate Side Pull Separator

The BioMag 96-Well Plate Side Pull Separator is a durable magnetic separation unit designed to accommodate 96-well plates that allow the magnetic pins to fit between the individual wells. This separator allows particles to be pulled to the sides, giving access to the bottom of the wells for more complete fluid removal and less chance of particle aspiration. The magnetic separator consists of 24 permanent neodymium-iron-boron rod magnets embedded in a plastic frame. See PDS 575A.

| Catalog Number | Description | Capacity |
|----------------|--|---------------------------|
| MS005 | BioMag 96-Well Plate Side Pull Separator | 96-well plate (side pull) |

Please see BangsLabs.com for pricing or contact a local agent.



BioMag® Flask Separator

The BioMag Flask Separator is one 12.5cm x 6cm rectangular magnetic separation unit designed for use with tissue culture flasks. Test tubes may be used with this unit by securing them against the magnet with a rubber band. The unit consists of permanent magnets encased in a plastic frame. See PDS 703.

| Catalog Number | Description | Capacity |
|----------------|------------------------|-----------------------------------|
| MS004 | BioMag Flask Separator | tissue culture flask / test tubes |

Please see BangsLabs.com for pricing or contact a local agent.

OTHER EQUIPMENT

Vivaspin® Ultrafiltration Device

Vivaspin® Concentrators are disposable ultrafiltration devices that may be utilized for the washing and concentration of submicron (20 nm - 0.5µm) microspheres. Vivaspin® present an excellent (fast, easy, economical) alternative to dialysis or more laborious/wasteful filtration devices. See PDS AA022.

| Catalog Number | Description | Capacity |
|----------------|---------------------------------------|---------------|
| AA022 | Vivaspin® 2 mL Ultrafiltration device | 2mL × 5 units |

Please see BangsLabs.com for pricing or contact a local agent.

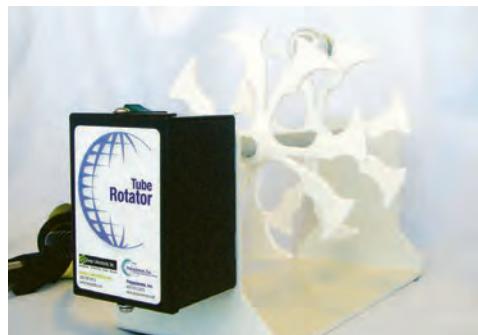


Tube Rotator

Bangs' Tube Rotator features a removable shaft assembly with polypropylene holders for rotating bottles and tubes. (Supplied with 110 volt power cord. Used in U.S. & Canada) See PDS 699.

| Catalog Number | Description | Capacity |
|----------------|--------------|--------------|
| ROTAT | Tube Rotator | configurable |

Please see BangsLabs.com for pricing or contact a local agent.



CUSTOM & OEM SERVICES



Capability

Bangs Laboratories' 30 years of experience in microsphere synthesis and fine particle analysis have established us as a leading supplier of polymer, silica and magnetic microspheres to diagnostic companies and instrument manufacturers. We understand what it takes to get new assays and instruments to market, and we have the products and the know-how to support you in your development process. We manufacture at scales that will carry you from R&D through production, and under an ISO 13485:2016 Quality System that will meet your regulatory needs.

Our specialty products for instrument standardization and bioseparations speak to our dyeing, coating, and surface modification capabilities. We are also pleased to offer custom formulations, concentrations, and packaging for our OEM customers.

Quality

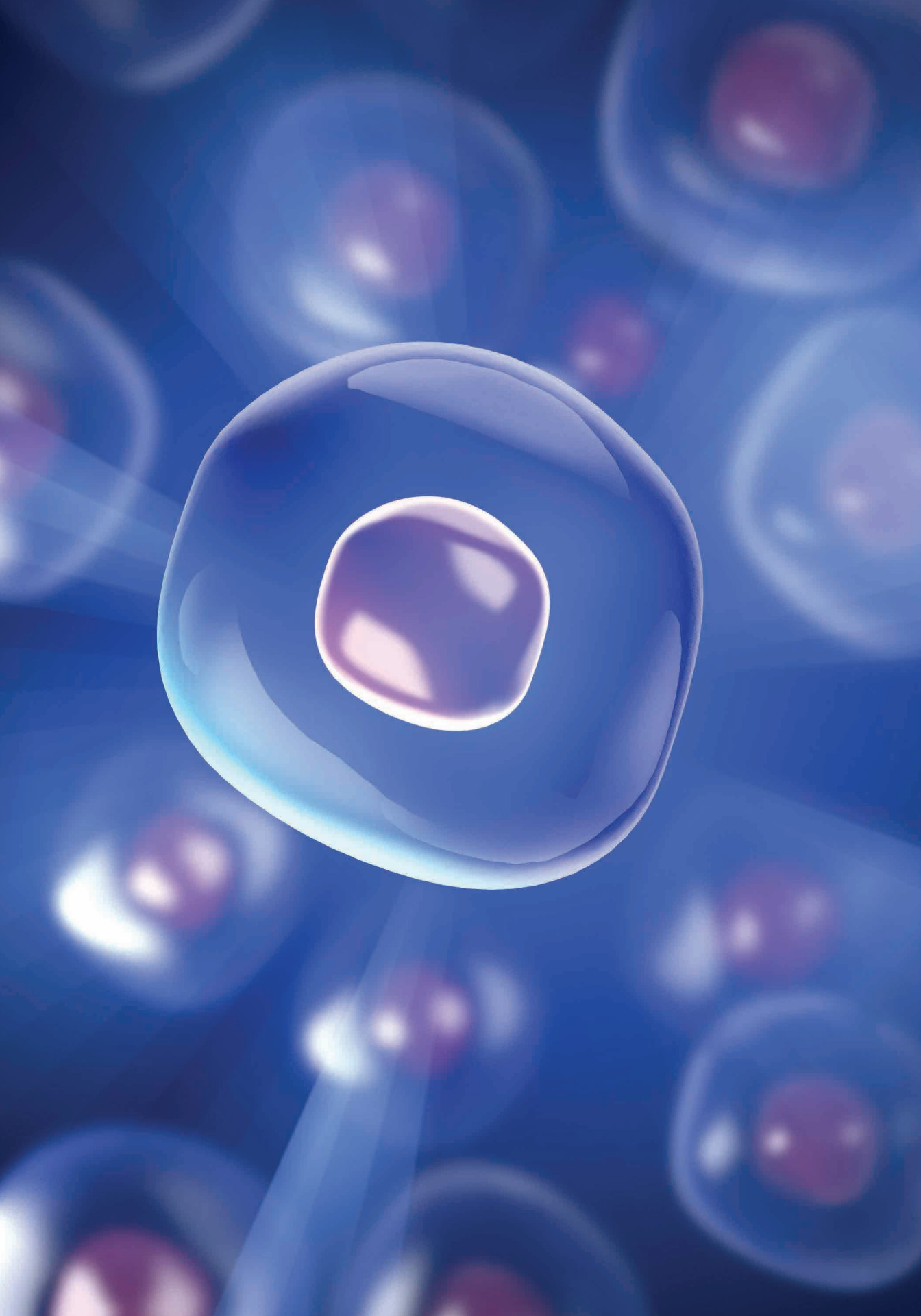
Product quality and customer satisfaction are corporate imperatives, and our Quality Management System has been certified to comply with ISO 13485:2016. In addition to maintaining a rigorous adherence to our own quality objectives, we work closely with our customers to ensure that we fully capture your unique product specifications and any other quality requirements.

Support

Client relationships are extremely important to us, and extend far beyond the scope of a given order or project. Our customer and technical support never expire - we are committed to you from initial discussions through the product lifecycle and beyond.

We welcome inquiries regarding these and other types of projects. Please contact us to learn how we may be of assistance in formulating solutions to meet your specific requirements.





MAGNETIC BIOSEPARATIONS

Magnetic microparticles offer a highly convenient means to conduct a variety of bioseparations. Particles may be coated with antibodies, lectins, or oligonucleotides to effect separations of specific cell populations or target sequences, and kits and protocols are available for nonspecific or targeted isolations. We offer a broad range of magnetic particle-based kits and specific coatings for the enrichment of cell populations, depletion of abundant proteins from serum, and isolation of glycoproteins and nucleic acids.

Many of our bioseparation products are based on BioMag[®] and BioMag[®]Plus magnetic particle technology. The irregular morphology affords much greater surface area than that of similarly sized spherical particles, resulting in high capture efficiency with conservative use of particles.

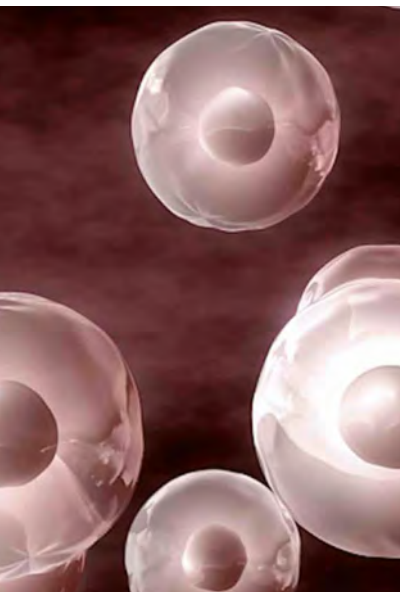
We also offer several types of affinity ligand coated and carboxylated magnetic particles for customizable and general isolations, including streptavidin particles for biotinylated oligos and Magnefy[™] COOH for SPRI-based nucleic acid isolation.

| Separation | |
|-------------------------|---|
| Antibodies | BioMag [®] Protein A or Protein G and ProMag [®] Protein G |
| Proteins | BioMag [®] , ProMag [®] , ProMag [®] HP or COMPEL |
| Glycans, glycoproteins | BioMag [®] WGA or ConA |
| Cells | BioMag [®] anti-CD marker or secondary antibody |
| Subcellular organelles | BioMag [®] (antibody-coated) |
| Immunoprecipitates | BioMag [®] secondary antibody |
| mRNA | BioMag [®] Oligo dT(20) or mRNA Purification System |
| DNA (total-SPRI) | Magnefy [™] or BioMag [®] COOH |
| DNA (specific sequence) | ProMag [®] ProMag [®] HP, Magnefy [™] , COMPEL [™] , or BioMag [®] Streptavidin or COOH (oligo attachment) |
| Biopanning | ProMag [®] , COMPEL [™] , or BioMag [®] |

CELL SEPARATIONS

BioMag® anti-Leukocyte for Human or Mouse

BioMag anti-Leukocyte particles are coated with anti-CD antibodies for the selection of specific cell subsets from purified leukocyte preps or whole blood. Positive selections permit rapid and efficient isolation of target cell populations. Cocktails of BioMag anti-CD particles may be developed for use in negative selections. See website for specific product data sheets.



| Catalog Number | Description | Concentration | Unit size |
|----------------|-------------------------|---------------|-----------|
| BM595 | BioMag anti-Human CD2 | 4 mg/mL | 5mL |
| BM580 | BioMag anti-Human CD3 | 4 mg/mL | 5mL |
| BM581 | BioMag anti-Human CD4 | 1.5 mg/mL | 5mL |
| BM583 | BioMag anti-Human CD8 | 1.5 mg/mL | 5mL |
| BM596 | BioMag anti-Human CD11b | 1 mg/mL | 5mL |
| BM584 | BioMag anti-Human CD14 | 1.5 mg/mL | 5mL |
| BM586 | BioMag anti-Human CD19 | 4 mg/mL | 5mL |
| BM587 | BioMag anti-Human CD34 | 4 mg/mL | 5mL |
| BM588 | BioMag anti-Human CD45 | 4 mg/mL | 5mL |
| BM589 | BioMag anti-Human CD56 | 4 mg/mL | 5mL |
| BM590 | BioMag anti-Human CD71 | 4 mg/mL | 5mL |
| BM592 | BioMag anti-Mouse CD4 | 1 mg/mL | 5mL |
| BM593 | BioMag anti-Mouse CD8a | 1 mg/mL | 5mL |
| BM594 | BioMag anti-Mouse CD45R | 1 mg/mL | 5mL |

Please see BangsLabs.com for pricing or contact a local agent.

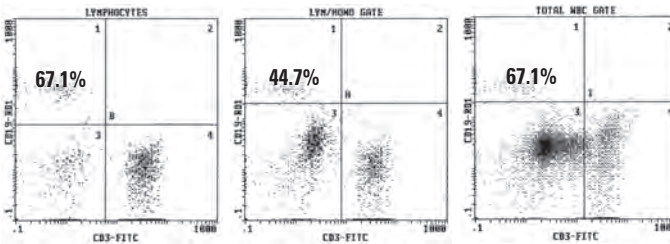
BioMag® Human T cell Enrichment Systems

BioMag Human T cell Enrichment Systems are available for the enrichment of CD3+, CD4+, or CD8+ T cell fractions from human peripheral blood mononuclear cells. These systems involve the magnetic removal of subpopulations positive for other CD markers, leaving the untouched CD3+, CD4+, or CD8+ fractions for analysis. See PDS 597.

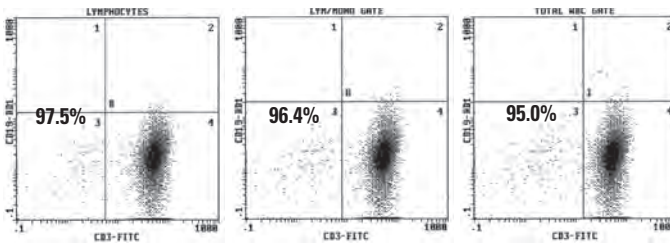
| Catalog Number | Description | Concentration | Unit size |
|----------------|--|---------------|------------|
| BM597 | BioMag Human CD3+ T cell Enrichment System | 1 mg/mL | 1mL or 5mL |
| BM598 | BioMag Human CD4+ T cell Enrichment System | 1 mg/mL | 1mL or 5mL |
| BM599 | BioMag Human CD8+ T cell Enrichment System | 1 mg/mL | 1mL or 5mL |

Please see BangsLabs.com for pricing or contact a local agent.

Pre-Enrichment



Post-Enrichment



The BioMag Human CD3⁺ T cell Enrichment System targets removal of CD19⁺, CD16⁺, CD14⁺, CD56⁺, CD11b⁺, and CD36⁺ cells. Particle to target cell ratio = 5.6.

CELL SEPARATIONS

BioMag® Secondary Antibody

BioMag secondary antibody particles are used extensively in the capture of immune complexes for immunoprecipitation and separation of primary antibody-labeled cells. Secondary antibody coatings also afford a convenient method for binding specific primary antibodies to BioMag particles. See website for specific product data sheets.

| Catalog Number | Description | Concentration | Unit size |
|----------------|--|---------------|---------------|
| BM563 | BioMag Goat anti-Human IgG | 1 mg/mL | 50mL |
| BM562 | BioMag Goat anti-Human IgG (Fc) | 5 mg/mL | 50mL |
| BM561 | BioMag Goat anti-Human IgM | 1 mg/mL | 50mL |
| BM549 | BioMag Goat anti-Mouse IgG | 1 mg/mL | 50mL or 500mL |
| BM550 | BioMag Goat anti-Mouse IgG (Fc) | 5 mg/mL | 50mL or 500mL |
| BP619 | BioMag Plus Goat anti-Mouse IgG | 1 mg/mL | 50mL |
| BP612 | BioMag Plus Goat anti-Mouse IgG Antibody Coupling Kit* | 1 mg/mL | 25mL |
| BM558 | BioMag Goat anti-Mouse IgM | 1 mg/mL | 50mL or 500mL |
| BM559 | BioMag Goat anti-Rabbit IgG | 1 mg/mL | 50mL or 500mL |
| BM560 | BioMag Goat anti-Rat IgG | 1 mg/mL | 50mL or 500mL |
| BM548 | BioMag Goat anti-Rat IgG (Fc) | 5 mg/mL | 50mL or 500mL |
| BM557 | BioMag Goat anti-Rat IgM | 5 mg/mL | 50mL or 500mL |

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Plus Mouse anti-Fluorescein IgG

BioMag Plus Mouse anti-Fluorescein IgG particles may be used to isolate fluorescein-tagged species such as labeled cells or nucleic acids. See PDS 622.

| Catalog Number | Description | Concentration | Unit size |
|----------------|--|---------------|-----------|
| BP622 | BioMag Plus Mouse anti-Fluorescein IgG | 1 mg/mL | 50mL |

Please see BangsLabs.com for pricing or contact a local agent.

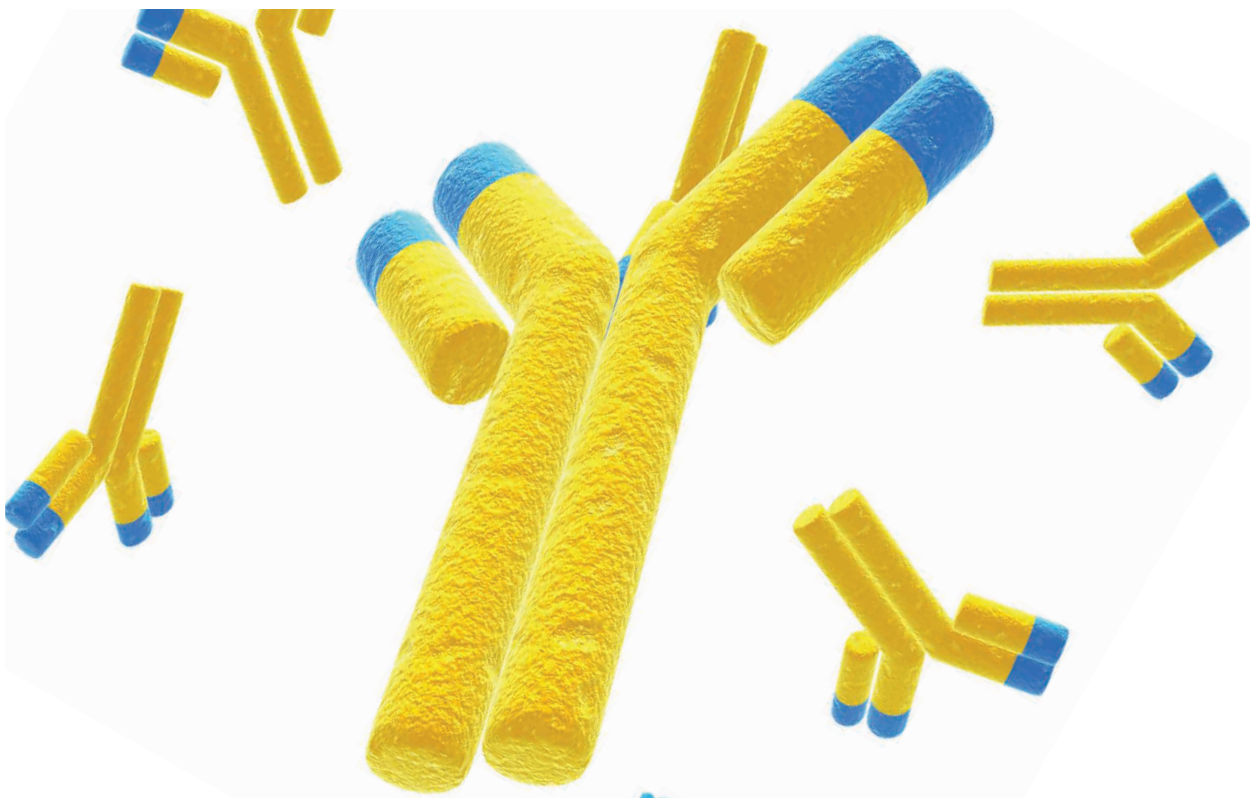
ANTIBODY ISOLATION

BioMag® Protein A and Protein G

Bangs offers BioMag Plus Protein A or Protein G particles and Isolation Kits for the isolation of antibody-labeled cells or the recovery of antibodies from serum and cell culture supernatants. BioMag Plus Protein A or Protein G are also suitable for binding immunoglobulins, as an effective adsorbent for removal of Fc fragments during Fab fragment preparation, and in immunoassay systems. See website for specific product data sheets.

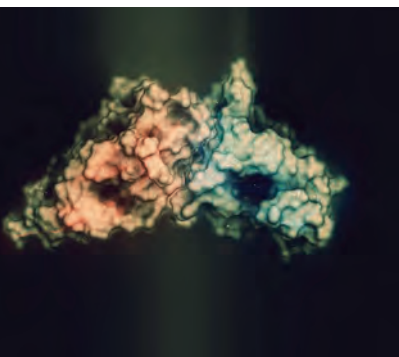
| Catalog Number | Description | Concentration | Unit size |
|----------------|---|---------------|-----------|
| BM554 | BioMag Protein A | 5 mg/mL | 2 or 10mL |
| BP620 | BioMagPlus Protein A | 5 mg/mL | 2 or 10mL |
| BP614 | BioMag Plus Protein A Antibody Isolation Kit* | 5 mg/mL | 2.5mL |
| BM553 | BioMag Protein G | 5 mg/mL | 2 or 10mL |
| BP627 | BioMag Plus Protein G | 5 mg/mL | 2 or 10mL |
| BP626 | BioMag Plus Protein G Antibody Isolation Kit* | 5 mg/mL | 2.5mL |

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.



GLYCANS / GLYCOPROTEINS

Our ConA- and WGA-coated BioMag Plus microparticles provide a convenient means for isolating glycoproteins from serum or cell lysate, and for investigating other lectin / glycan-mediated processes. The BioMag Plus magnetic particle format provides high surface area, and permits easy and efficient separations.

**BioMag®Plus Concanavalin A**

Concanavalin A (Con A) is a 104,000 Da protein comprised of four identical subunits, and exists as an active dimer or tetramer depending upon pH. Its carbohydrate binding partners are α -D-glucose and α -D-mannose with unmodified OH groups at C-3, C-4, and C-6, and terminal glucose residues of proteins and peptides. The unique saccharide-binding properties of Concanavalin A have made it useful for the labeling and isolation of glycan-presenting cells and glycoproteins in serum and cell lysate. Lectins have additionally been used in cell adhesion studies, to effect lymphocyte activation, and to explore carbohydrate-based therapeutics. See PDS 720.

| Catalog Number | Description | Concentration | Unit size |
|----------------|----------------------------|---------------|--------------|
| BP531 | BioMag Plus Concanavalin A | 5 mg/mL | 3mL or 10 mL |

Please see BangsLabs.com for pricing or contact a local agent.

BioMag®Plus Wheat Germ Agglutinin

Wheat germ (*Triticum vulgare*) agglutinin (WGA) is a 36,000 Da protein comprised of two identical subunits. Its primary sugar-binding partner is N-acetylglucosamine (GlcNAc), and it binds most securely to GlcNAc dimers and trimers. WGA is a binder of gram-positive bacteria, via GlcNAc moieties in the peptidoglycan layer of the cell wall. WGA also interacts with saccharides with terminal GlcNAc, chitobiose, or sialic acid residues. WGA does not contain protein-bound carbohydrate, and is not blood group specific. See PDS 716.

| Catalog Number | Description | Concentration | Unit size |
|----------------|-----------------------------------|---------------|--------------|
| BP530 | BioMag Plus Wheat Germ Agglutinin | 5 mg/mL | 3mL or 10 mL |

Please see BangsLabs.com for pricing or contact a local agent.

NUCLEIC ACIDS

BioMag® and BioMag®Plus superparamagnetic microparticles are utilized in the magnetic separation of nucleic acids. The irregular shape of BioMag and BioMag Plus particles affords a much greater surface area than that of the same size spherical particles. This large surface area results in high binding capacities, allowing efficient target capture with minimal amounts of particles. Additionally, their greater than 90% iron oxide content allows for faster magnetic separations, especially on automated high throughput platforms. *Note: See other SA supports in the Test Developer Section.*

BioMag® Streptavidin

Bangs offers streptavidin-coated magnetic particles in our BioMag and BioMag Plus product lines. A BioMag Plus Streptavidin / Biotin Binding Kit for the attachment of biotinylated proteins to BioMag Plus superparamagnetic particles is also available. See PDS 551 and PDS 621.

| Catalog Number | Description | Concentration | Unit size |
|----------------|---|---------------|-----------|
| BM551 | BioMag Streptavidin | 5 mg/mL | 5 or 50mL |
| BP628 | BioMag Plus Streptavidin | 5 mg/mL | 10mL |
| BP621 | BioMag Plus Streptavidin / Biotin Binding Kit* (suitable for biotinylated molecules) | 5 mg/mL | 5mL |

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Streptavidin, Nuclease-free

Streptavidin-coated BioMag particles are offered as a nuclease-free preparation for the binding or capture of biotinylated nucleic acids. See PDS 530.

| Catalog Number | Description | Concentration | Unit size |
|----------------|------------------------------------|---------------|----------------------|
| BM568 | BioMag Streptavidin, Nuclease-free | 1 mg/mL | 10mL, 25mL, or 100mL |

Please see BangsLabs.com for pricing or contact a local agent.

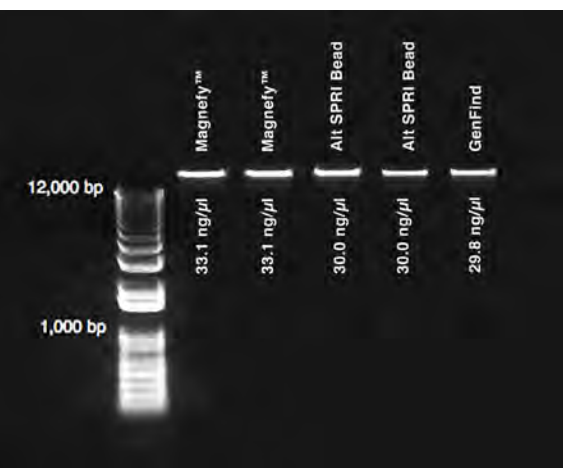
BioMag® mRNA Purification System & BioMag® Oligo dT

Nuclease-free suspensions of BioMag with covalently-bound oligo dT(20) are utilized for the efficient isolation of polyadenylated mRNA from total RNA, tissue or cell lysate. Following isolation, mRNA is eluted through a simple incubation in DEPC-treated water. BioMag Oligo dT(20) particles may be purchased alone or as a component of our BioMag mRNA Purification System. See PDS 569.

| Catalog Number | Description | Concentration | Unit size | # of Reactions |
|----------------|--|---------------|-----------|--|
| BM569 | BioMag mRNA Purification System Featuring BioMag Oligo dT(20), Nuclease-free particles | 5 mg/mL | 2mL | 20 x 100µg total RNA; or 10 x 50–100mg tissue; or 10 x lysate from 5x10 ⁶ cells |
| BM529 | BioMag Oligo dT(20), Nuclease-free | 5 mg/mL | 2mL | 20 x 100µg total RNA |

Please see BangsLabs.com for pricing or contact a local agent.

NUCLEIC ACIDS



Magnefy™

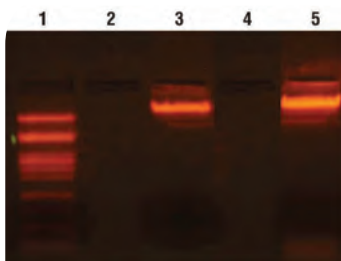
Meet the newest addition to our family of magnetic particles—Magnefy™ ~1µm carboxylated superparamagnetic microspheres. As high surface area / high surface titer microparticles with a rapid separation profile, Magnefy offer an additional performance-driven solid phase for magnetic particle-based assays and isolations, particularly SPRI-based total DNA isolation. See PDS 756.

| Catalog Number | Description | Nominal Diameter | Unit size |
|----------------|---------------|------------------|------------------------|
| MFY0001 | Magnefy™ COOH | 1µm | 5mL, 10mL, 25mL, 100mL |

(~5% solids 50mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

SNARe™ DNA Purification Systems

SNARe DNA Purification Systems offer rapid, economical methods for isolating DNA. The Purification Systems utilize SNARe DNA Separation Particles—high surface area, superparamagnetic particles with a mean diameter of ~1.5µm. Once bound, the stable DNA-particle complex may be washed to remove impurities and unwanted proteins. Upon elution, the clean DNA preparation is suitable for use in downstream applications such as PCR, labeling, sequencing, transfection, and cloning. See PDS 691, 691A, 692, and 693.



- Lane 1: Molecular Weight Standards Lambda DNA PST-1
- Lane 2: Blank
- Lane 3: Competing Isolation Technology
- Lane 4: Blank
- Lane 5: SNARe DNA Purification System

| Catalog Number | Description | # of Reactions |
|----------------|---|-------------------------------|
| BP691 | SNARe Whole Blood Genomic DNA Purification System | 100 x 200µL whole blood |
| BP692 | SNARe Plasmid DNA Purification System | 100 x 1–3mL bacterial culture |
| BP693 | SNARe Plant Genomic DNA Purification System | 100 x 50–100mg tissue |

Please see BangsLabs.com for pricing or contact a local agent.

PROTEIN REMOVAL

Changes that occur in the expression of serum and plasma proteins have long been recognized as a way to investigate and monitor physiological changes. This rich source of information does, however, present challenges for many analytical methods. Specifically, HPLC and mass spectrometry have a limited dynamic range for the amount of protein that can be loaded and resolved. Albumin may represent 50-70% and IgG 10-20% of the total protein in serum, masking the ability to detect proteins that are present at low concentrations. If the majority of these two proteins can be removed from serum samples, a significant improvement in resolution of less abundant proteins can be achieved.

BioMag® ProMax Albumin Removal Kit

The magnetically responsive BioMag® ProMax Albumin Removal Particles supplied in the kit, in combination with specific buffer conditions, allow the binding and release of less abundant proteins in serum, while minimizing the binding of albumin, so that it may be washed away. See PDS 658.



ProMax Albumin Removal Gels

| Catalog Number | Description | # of Reactions |
|----------------|-----------------------------------|-----------------------|
| BP658 | BioMag ProMax Albumin Removal Kit | 25 x 10 μ L Serum |

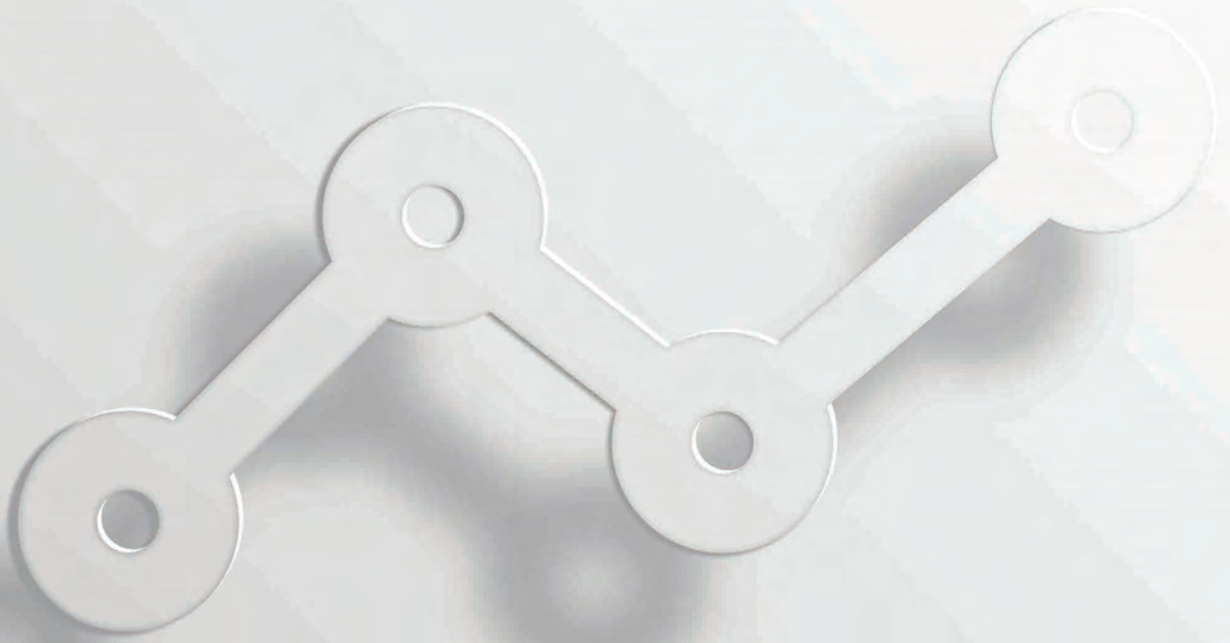
Please see BangsLabs.com for pricing or contact a local agent.

BioMag® ProMax Serum IgG Removal Kit

The ProMax IgG Removal Particles and specific buffer conditions bind IgG from serum, permitting its depletion from the sample. Removal of IgG with the ProMax IgG Removal Kit is a rapid and simple procedure that requires no pretreatment of the sample. In addition, the ProMax system does not require the use of time-consuming columns or centrifugation. The ProMax protocol is scalable and can be used in conjunction with the BioMag® ProMax Albumin Removal Kit. See PDS 659.

| Catalog Number | Description | # of Reactions |
|----------------|-------------------------------------|----------------------|
| BP659 | BioMag ProMax Serum IgG Removal Kit | 10 x 1 μ L Serum |

Please see BangsLabs.com for pricing or contact a local agent.



INSTRUMENT STANDARDS

Microsphere standards are essential for defining an instrument's capabilities and limitations in terms of sensitivity, precision and accuracy, and ensuring that it is stable and suitable for use. They aid in understanding the effects of extraneous factors such as temperature, humidity, and electronic noise, and are also important to gage studies and technician training and proficiency programs.

Bangs Laboratories manufactures a comprehensive range of standards for analytical instruments such as cell analyzers, particle sizers, flow cytometers and fluorescence microscopes. Our offerings include NIST Traceable Particle Size Standards, SureCount™ Count Standards, ViaCheck™ Cell Viability and Concentration Controls, in addition to a broad range of fluorescent and antibody capture beads for Flow Cytometry, and fluorescent beads and slides for imaging applications.

We invite you to browse our catalog of instrument standards and associated online technical library, and to contact our technical customer support staff if we can be of help in product selection or to discuss the custom manufacture of a product to meet your unique needs.

Run microsphere standards



Record and Track QC data



PASS:
Approve for use



FAIL:
Troubleshoot & Correct
Service Visit

FLOW CYTOMETRY QUALITY CONTROL

When designing a flow cytometry QC program, the unique needs of the department or facility should be considered. Some products may satisfy multiple tasks, such as a single bead used for basic daily QC and set-up of dedicated instruments. In other instances, combinations of products may be appropriate to meet the unique requirements of specific studies, or for instruments with shared use.

The below table is intended to provide a framework to aid in product selection for both initial validation and continued management of an instrument. This ensures surveillance of the complete system, i.e. the optics (lasers, detectors, flow cell alignment), fluidics (observation of flow rates, time delay confirmation), and associated computing. Recording and tracking results can confirm satisfactory performance, or aid in identifying both random (electronic noise, air bubbles, etc.) and systemic errors (bias, shifts and trends due to temperature fluctuation, laser deterioration, misalignment, etc.) so that corrective action may be taken.

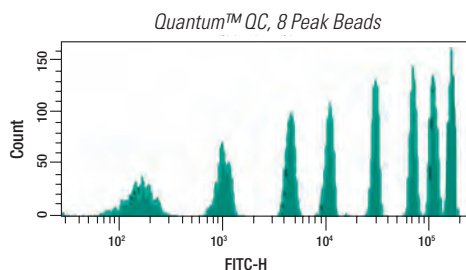
Please feel free to contact us to discuss what products are available to support the unique requirements of your QC program or study.

Example of a basic QC program for a 2 laser cytometer

| Frequency | Product | Purpose | Coverage | Data |
|-------------------------------|---|--|---|--|
| Daily | Full Spectrum (# 885) or Quantum QC (# 725) | Basic check of system; Laser alignment check | All lasers/ detectors | Chart channel values; Record CVs |
| Daily for quantitative | Quantum MESF (See page 82) | Run at specific PMTs for quantitative expression analyses: Linearity, resolution, detection threshold, alignment | Specific detector | Confirm resolution; Record linearity; Chart detection threshold and CV |
| Weekly | Quantum QC (#725) | For qualitative analyses; Linearity, resolution, detection threshold, alignment | All lasers/ detectors | Confirm resolution; Record linearity; Chart detection threshold and CV |
| Weekly | Time Delay Standard (#830) (See page 75) | Time delay check | Delay between laser 1 (488nm) and laser 2 (635nm) | Confirm time delay |

Quantum™ QC, 8 Peak Beads

Quantum QC is a multi-intensity, multi-fluorescent standard that is intended for use as an in-depth tool for daily cytometer QC. It is appropriate for use with all lasers and detectors and may be used to determine detection thresholds, understand detector resolution, and assess and track linearity. It can aid in providing confidence that the system is suitable for use, or alert operators to potential problems before samples are run.



Quantum QC may also be used for instrument set-up to achieve standardized PMT settings and define the window of analysis for relevant detectors. See PDS 725 & 725A for all representative histograms.

| Catalog Number | Description | Unit Size |
|----------------|--------------------------|-----------|
| 725 | Quantum QC, 8 Peak Beads | 100 Tests |

Please see BangsLabs.com for pricing or contact a local agent.

Full Spectrum™

Full Spectrum™ microspheres provide a convenient means for performing the initial daily QC check on 3-9+ color instruments. The microspheres are internally labeled with multiple fluorophores for use with common excitation and detection wavelengths within the visible spectrum. See PDS 885.

| Catalog Number | Description | Unit Size |
|----------------|----------------|------------------------------|
| 885 | Full Spectrum™ | A(20), B (100), C(280) Tests |

Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY QUALITY CONTROL

Fluorescence Reference Standards

Single-color Fluorescence Reference Standards are labeled with specific fluorochromes to exhibit the same spectral characteristics as labeled cells. These standards may be used to QC a specific path of the optical system (laser / filter / PMT), to optimize filter and mirror sets for fluorophores, and to establish a test-specific Target Channel Value for instrument set-up. See PDS 890.

| Catalog Number | Description | MW | Excitation (nm) | Emission (nm) | Purpose |
|----------------|-------------------------------|------------------|-----------------|---------------|------------------|
| 890 | Certified Blank™ | - | - | - | reference |
| 897 | Acridine Orange | 265 | 500 | 526 | DNA/RNA |
| 886 | Alexa Fluor® 488 | 643 | 499 | 519 | conjugate |
| 887 | Alexa Fluor® 647 | 1300 | 652 | 668 | conjugate |
| 901 | Allophycocyanine (APC) | 104k | 650 | 660 | conjugate |
| 914 | APC-Cy™7 | 104k | 650 | 767 | conjugate |
| 898 | Chlorophyll (a + b) | 8014 (a) 907 (b) | 430,453 | 642,662 | plant pigment |
| 895 | Cy™5 | 792 | 649 | 666 | conjugate |
| 906 | DAPI | 277 | 350 | 470 | DNA (A-T) |
| 913 | Far-Out Red | - | 475,590 | 663 | reference |
| 891 | Fluorescein | 389 | 495 | 519 | conjugate |
| 894 | Hoechst 33342 | 616 | 346 | 375,390 | dsDNA |
| 916 | Pacific Blue™ | 339 | 410 | 455 | conjugate |
| 899 | PE (R-Phycoerythrin) | 240k | 480, 565 | 578 | conjugate |
| 908 | PE-Cy™5 | 240k | 480,565,650 | 670 | conjugate |
| 889 | PE-Cy™7 | 240k | 480 | 767 | conjugate |
| 909 | PE-TR | 240k | 480,565,650 | 670 | conjugate |
| 892 | Propidium Iodide | 668 | 536 | 617 | DNA intercalator |
| 905 | T.M. Rhodamine (TRITC, TAMRA) | 430 | 557 | 576 | conjugate |
| 893 | Texas Red® (Sulforhodamine) | 625 | 589 | 615 | conjugate |
| 915 | Violet Laser (Glacial Blue) | - | 360 | 450 | reference |

Please see BangsLabs.com for pricing or contact a local agent.

ALIGNMENT

Microspheres with narrow fluorescence coefficients of variation (CVs) are used for alignment. Fixed alignment instruments are verified periodically, while tunable instruments are aligned on a daily basis. Some applications, such as DNA content analysis, will also dictate daily alignment verification.

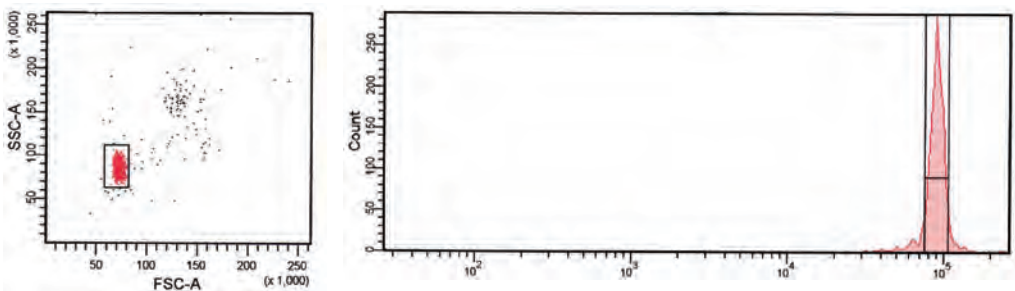
Although reference fluorescence CVs are provided on product Certificates of Analysis, it is important that instrument-specific tolerances be established. These should be developed on an optimally aligned instrument, i.e. immediately following a service visit. Keep in mind that fluorescence CV is dependent upon flow rate, concentration, and the optical system of the instrument.

Right Reference Standard™

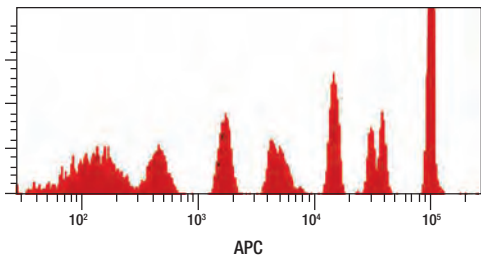
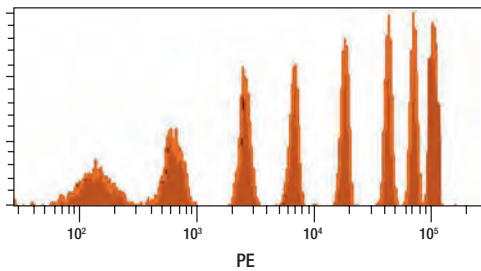
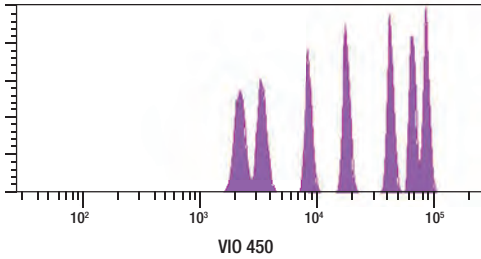
Each standard consists of a population of microspheres surface-labeled with a single fluorochrome at a high intensity level. With their narrow fluorescence CVs, Right Reference Standard products are suitable for alignment purposes. These standards may also be used to QC a specific path of the optical system (laser / filter / PMT), and to establish a unified fluorescence range for a particular detector. See PDS 510.

| Catalog Number | Description | Unit size |
|----------------|---|-----------|
| 512 | Right Reference Standard Fluorescein High Level | 100 tests |
| 515 | Right Reference Standard Phycoerythrin High Level | 100 tests |
| 518 | Right Reference Standard PE-Cy™5 High Level | 100 tests |
| 521 | Right Reference Standard APC High Level | 100 tests |

Please see BangsLabs.com for pricing or contact a local agent.



FLOW CYTOMETRY QUALITY CONTROL



Quantum™ QC histograms

LINEARITY

The accurate measurement of fluorescence signal is imperative for applications in quantitative fluorescence cytometry, such as surface marker expression or telomere length determination. To this end, the linear response of the PMTs must be assessed regularly.

Fluorochrome-labeled microspheres of differing intensities are used to generate a standard curve relating channel values to fluorescence intensity. Our QuickCal (linearity) analysis template (pg 84-85) calculates a regression and reports the regression coefficient (r^2), which should be as near as possible to 1.0. Deviations may indicate the need for maintenance or calibration of components of the instrument’s optical system.

Quantum™ QC, 8 Peak Beads

Quantum QC is a multi-intensity, multi-fluorescent standard that is intended for use as an in-depth tool for daily cytometer QC, and is appropriate for use with all lasers and detectors. It may be used to determine detection thresholds, understand resolution, and assess and track linearity of detectors. It can aid in providing confidence that the system is suitable for use, or alert operators to potential problems before samples are run.

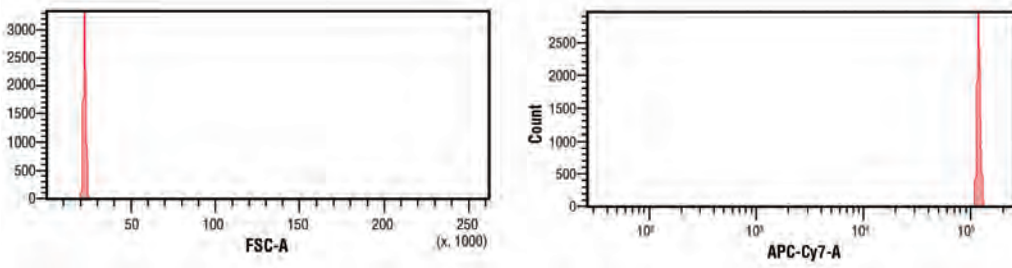
Quantum QC may also be used for instrument set-up to achieve standardized PMT settings and define the window of analysis for relevant detectors. See PDS 725 & 725A for all representative histograms.

| Catalog Number | Description | Unit Size |
|----------------|--------------------------|-----------|
| 725 | Quantum QC, 8 Peak Beads | 100 Tests |

Please see BangsLabs.com for pricing or contact a local agent.

TIME DELAY

Flow cytometers generate a tremendous amount of data for each cell that is analyzed, and this is particularly true for instruments equipped with more than one laser. To be meaningful, the information that is collected by the detectors off of each laser must be integrated and attributed to the proper cell. Provided that time delays are in calibration, the instrument is able to “track” the cell as it passes by each laser for correct data assimilation and reporting.



The highly uniform Time Delay Calibration Standard exhibits red / far-red emission.

Time Delay Calibration Standard

Bangs’ Time Delay Calibration Standard is intended for use in assessing the delay between blue and red lasers. It features ~6µm microspheres dyed with a fluorophore that is excited at 488nm and 635nm, and exhibits red / far-red emission. See PDS 831.

| Catalog Number | Description | Unit Size |
|----------------|---------------------------------|-------------------------------|
| 830 | Time Delay Calibration Standard | A(20), B (100), C(280) Tests |

Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY QUALITY CONTROL

GENERAL INSTRUMENT SET-UP

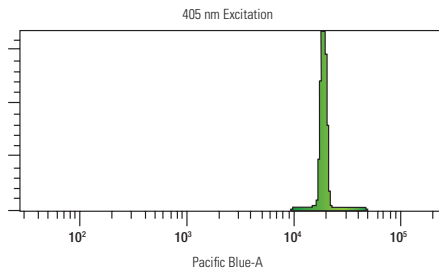
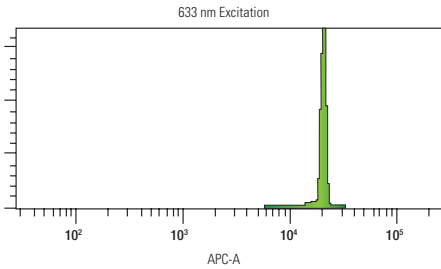
In flow cytometry, uniform instrument set-up and standardization are essential for achieving consistent results and generating comparable data. The program should be comprehensive, encompassing reagents, protocols, instrument configuration, and, for quantitative analyses, fluorescence intensity measurements.

Flow cytometers are highly configurable, and results can vary considerably with different instrument settings. Establishing a common “Window of Analysis” for each detector, with upper and lower fluorescence limits defined, allows reference populations to be positioned in approximately the same place on the scale. This type of standardized instrument set-up ensures consistency of results from specific instruments and enables meaningful data comparison between instruments. Standardized instrument set-up using Full Spectrum or Quantum QC can ameliorate differences in range, relative scale, and reporting units, as well as daily fluctuation due to electronic noise and ambient temperature and humidity.

| | |
|----------------------------|---|
| Instrument Standardization | PMT Voltages Compensation settings |
| Sample Protocols | Sample collection: Anticoagulant Sample storage conditions: Time & Temperature Sample preparation: Lysis, Fixation, Cooling / warming, & Staining |
| Reagents | Antibodies: Clone, Purity, Concentration & Labeling density, i.e. Fluorophore: Protein (F/P) ratio, Fixatives, Lysing agents & Anticoagulants |
| Fluorescence scale | Window of Analysis Fluorescence intensity units |

Full Spectrum™

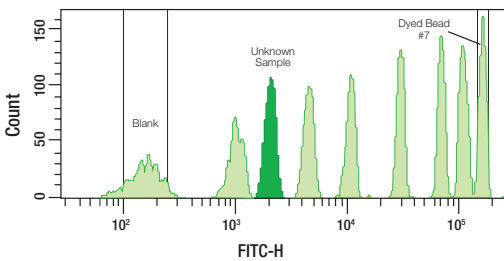
Full Spectrum™ microspheres are used to perform the initial daily QC check on 3-9+ color instruments. The microspheres are internally labeled with multiple fluorophores for use with common excitation and detection wavelengths within the visible spectrum. See PDS 885 for histograms for all detectors.



| Catalog Number | Description | Unit Size |
|----------------|----------------|--|
| 885 | Full Spectrum™ | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |

Please see BangsLabs.com for pricing or contact a local agent.

Quantum™ QC for window of analysis set-up.



Quantum™ QC, 8 Peak Beads

Quantum QC is a multi-intensity, multi-fluorescent standard that may be used to set up all detectors by positioning a specific peak at a target channel value. See PDS 725 & 725A for histograms for all detectors.

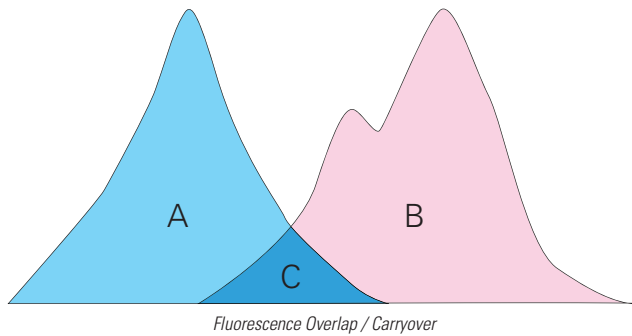
| Catalog Number | Description | Unit Size |
|----------------|--------------------------|-----------|
| 725 | Quantum QC, 8 Peak Beads | 100 Tests |

Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY INSTRUMENT SET-UP

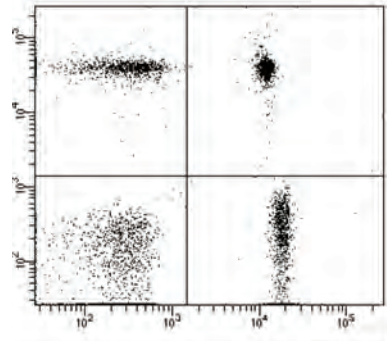
COMPENSATION

Microsphere standards offer a convenient means to establish compensation settings for multicolor analyses. Proper compensation requires reference materials that represent the actual fluorophore combinations of stained cells. Bangs offers microspheres pre-labeled with the same fluorophores that are used to stain cells in addition to microspheres featuring capture antibody or functional groups for labeling by the user.



FITC / PE Compensation Standard

The FITC / PE Compensation Standard includes four microsphere populations: an Autofluor™ population, and single populations surface labeled with FITC, PE, and FITC/PE. The Autofluor™ population is dyed with a low level of fluorophore to approximate the autofluorescence of an unstained resting lymphocyte. This kit is useful for establishing quadrant boundaries and compensation settings for analyses utilizing FITC and PE fluorochromes. See PDS 820.



| Catalog Number | Description | Unit Size |
|----------------|--|--|
| 820 | FITC / PE Compensation Standard (Autofluor™ / FITC-PE / FITC / PE) | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |

Please see BangsLabs.com for pricing or contact a local agent.

Simply Cellular® Compensation Standard

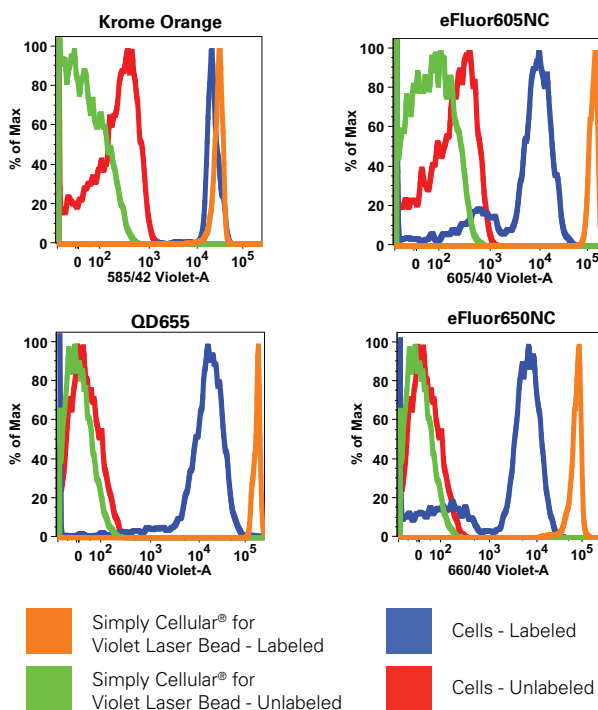
The Simply Cellular Compensation Standard includes a mixed population of low- and high-binding antibody-capture beads. Aliquots are labeled with antibody conjugates of interest to establish suitable compensation settings for specific analyses. Anti-Mouse IgG, anti-Rat IgG, and anti-human IgG versions are available. See PDS 850.

| Catalog Number | Description | Unit Size |
|----------------|---|---------------|
| 550 | Simply Cellular Compensation Standard (anti-Mouse IgG) | (B) 100 Tests |
| 556 | Simply Cellular Compensation Standard - High (anti-Mouse IgG) | (B) 100 Tests |
| 551 | Simply Cellular Compensation Standard (anti-Rat IgG) | (B) 100 Tests |
| 552 | Simply Cellular Compensation Standard (anti-Human IgG) | (B) 100 Tests |

Please see BangsLabs.com for pricing or contact a local agent.

Simply Cellular® anti-Mouse for Violet Laser

The Simply Cellular anti-Mouse for Violet Laser standard features microsphere populations comprised of a proprietary matrix that exhibits low autofluorescence with violet excitation. It includes mouse IgG binding and one blank population. Beads may be labeled with mouse mAbs conjugated with violet fluorochromes, and for use as a compensation or general reference standard for detectors off of the violet laser. Beads are also suitable for use with other fluorochromes and lasers / detectors, e.g. 488nm, 633nm. See PDS 835.



| Catalog Number | Description | Unit Size |
|----------------|---|-------------------------------|
| 835 | Simply Cellular anti-Mouse IgG for Violet Laser | (A) 20 Tests or (B) 100 Tests |

Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY INSTRUMENT SET-UP

Flow Cytometry Protein A or Protein G Antibody Binding Beads

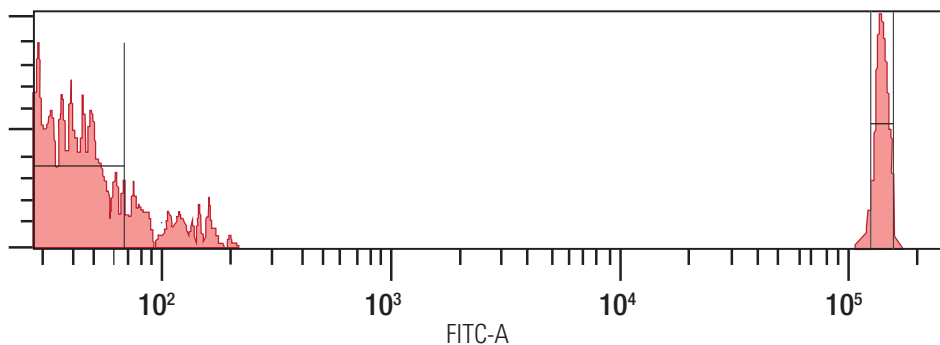
Single population Protein A or Protein G microspheres are suitable for labeling with conjugated antibodies from a range of hosts. Labeled microspheres may be used as single-population reference standards or in conjunction with an unlabeled population for compensation purposes. See page 31 or PDS 854 for a listing of affinities for IgG from specific hosts or of specific isotype.

| Catalog Number | Description | Unit Size |
|----------------|---|--|
| 553 | Flow Cytometry Protein A Antibody Binding Beads | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 554 | Flow Cytometry Protein G Antibody Binding Beads | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |

Please see BangsLabs.com for pricing or contact a local agent.

Viability Dye Compensation Standard

Viability Dye Compensation Standards are suitable for labeling with LIVE/DEAD® stains or other amine-reactive dyes to generate compensation standards for flow cytometric analyses. Beads are not suitable for labeling with DNA stains such as propidium iodide, DAPI, or SYTOX®, and users should contact us for discussion if uncertain as to the compatibility of a specific dye or stain. See PDS 853.



| Catalog Number | Description | Unit Size |
|----------------|--|-----------|
| 450 | Viability Dye Compensation Standard, 4µm | 3mL |
| 451 | Viability Dye Compensation Standard, 8µm | 3mL |

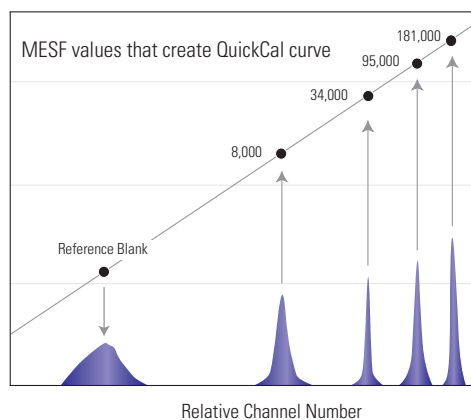
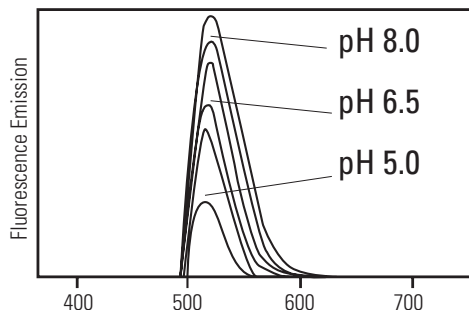
Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY FLUORESCENCE QUANTITATION

Fluorescence cytometry is an important tool for investigations in cell and molecular biology. This technology is routinely used for immunophenotyping and an expansive array of research applications, such as the study of protein phosphorylation, the determination of telomere length, and receptor occupancy.

Although fluorescence cytometry has proven to be a very powerful and versatile technology, it is not without limitations. Notably, without a standardized measure of fluorescence intensity, results of analyses can be described only in relative terms, such as “negative / positive,” “dim / intermediate / bright,” or in arbitrary fluorescence intensity units (e.g. MFI). The interpretation of fluorescence intensity measurements can be further complicated by factors such as daily instrument variation, differences in hardware (laser power, filter sets), PMT settings, software, environmental factors such as buffer pH, and fluorochrome labeling density of antibodies (F/P ratio). Quantitative fluorescence analyses demand the highest level of standardization. However, cytometers lack internal calibrators for fluorescence intensity, and are limited to reporting results in relative terms.

Our Quantum™ MESF and Quantum™ Simply Cellular® microspheres are external standards that enable the standardization of fluorescence intensity units irrespective of instrument and software. Moreover, they are labeled with the actual fluorochromes used to label cells, for synchronous response to the environment (consider the pH-responsive fluorescence intensity of fluorescein, upper right). The beads are run on the same day and at the same settings as samples to establish a calibration curve relating instrument channel values and standardized fluorescence intensity units (QuickCal, page 84-85). Unknowns may then be read against the curve for determination of expression (i.e. quantitation of the signal from each cell population). See our website for more resources such as product data sheets and a curated collection of application references.



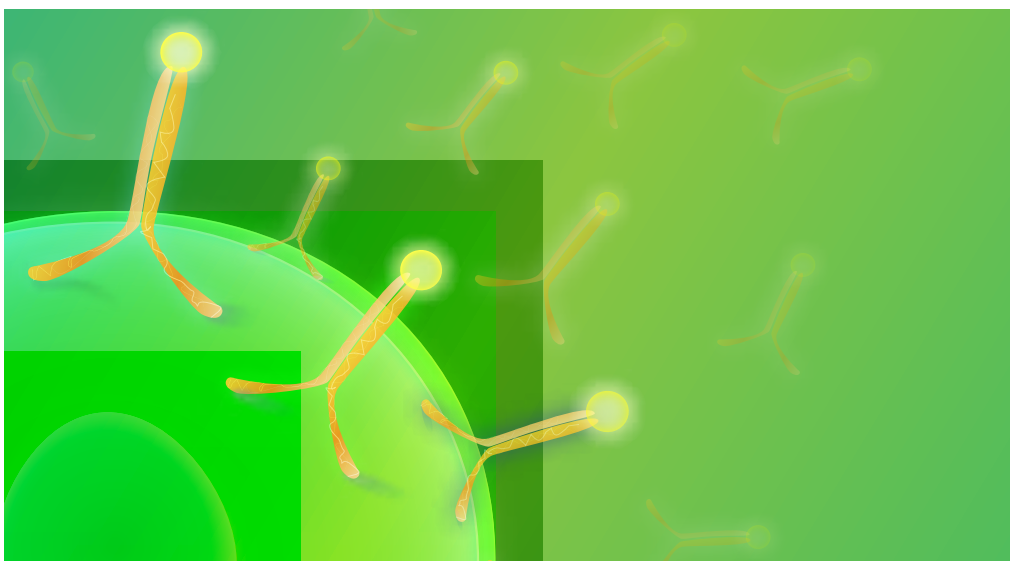
FLOW CYTOMETRY FLUORESCENCE QUANTITATION

Quantum™ MESF

Each Quantum MESF kit contains one blank population and a series of fluorescent microsphere populations labeled with varying amounts of Alexa Fluor® 488, R-PE, PE-Cy™5, Cy™5, Alexa Fluor® 647, or APC corresponding to standardized MESF units. Our MESF (Molecules of Equivalent Soluble Fluorochrome) provide a direct comparison of fluorescence measurements from solutions of the pure fluorochrome with those from microspheres surface-labeled with the same fluorochrome. A free QuickCal® analysis template (see pages 84-85) is provided with each kit to aid in determining expression levels of cells, and for evaluating instrument linearity and detection threshold. See PDS 821 and 818.

| Catalog Number | Description | Unit Size |
|-----------------------|-------------------------------|--|
| 488 | Quantum Alexa Fluor® 488 MESF | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 555 | Quantum FITC-5 MESF | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 555p | Quantum FITC-5 MESF (Premix) | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 827 | Quantum R-PE MESF | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 828 | Quantum PE-Cy™5 MESF | (A) 20 Tests |
| 822 | Quantum Cy™5 MESF | (A) 20 Tests, (B) 100 Tests |
| 647 | Quantum Alexa Fluor® 647 MESF | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 823 | Quantum APC MESF | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |

Please see BangsLabs.com for pricing or contact a local agent.



Quantum™ Simply Cellular®

Quantum Simply Cellular (QSC) kits are comprised of five microsphere populations: one blank and four labeled with increasing amounts of capture antibody. Each coated population binds a specific number of fluorophore-conjugated monoclonal antibodies of the noted host species, which is equivalent to its Antibody Binding Capacity (ABC) value. The beads are used to generate a calibration curve (QuickCal page 84-85), associating fluorescence intensity to the ABC values, or the number of bound antibodies. Our QuickCal software is used to determine the expression level of cells as well as instrument linearity and threshold. See PDS 814, 814A and 818.

| Catalog Number | Description | Unit Size |
|----------------|--|--|
| 815 | Quantum Simply Cellular anti-Mouse IgG | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 816 | Quantum Simply Cellular anti-Human IgG | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 817 | Quantum Simply Cellular anti-Rat IgG | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |

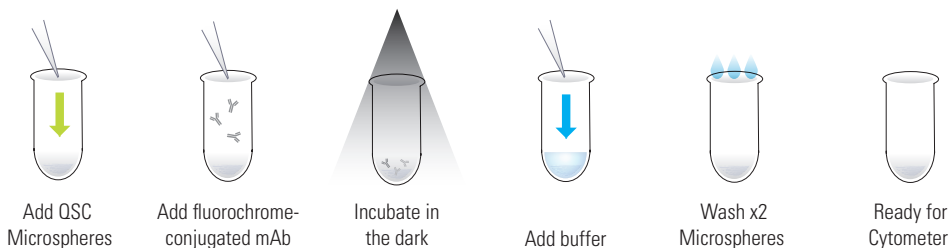
Please see BangsLabs.com for pricing or contact a local agent.

Simply Cellular®

Our Simply Cellular (SC) standard consists of a single population of antibody-coated microspheres of known Antibody Binding Capacity (ABC). The population is stained with the appropriate primary antibody and used in conjunction with a suitable Quantum MESF kit for determination of the antibody's effective Fluorophore / Protein (F/P) ratio. This standard may also be used to QC the fluorescence intensity of different antibody lots or clones. See PDS 814A and 849.

| Catalog Number | Description | Unit Size |
|----------------|--------------------------------|--|
| 810 | Simply Cellular anti-Mouse IgG | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 812 | Simply Cellular anti-Human IgG | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 813 | Simply Cellular anti-Rat IgG | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |

Please see BangsLabs.com for pricing or contact a local agent.



FLOW CYTOMETRY FLUORESCENCE QUANTITATION

QUICKCAL® ANALYSIS TEMPLATE

Bangs' Quantum™ systems for flow cytometry provide the means to standardize fluorescence intensity measurements, thereby permitting truly quantitative cellular expression analyses. Fluorochrome-labeled microspheres are used to generate a standard curve relating fluorescence intensity to standardized MESF or ABC values from Quantum™ MESF or Quantum™ Simply Cellular® kits. The MESF or ABC values of labeled cell samples may be determined by measuring their fluorescence intensities, and “reading” the corresponding MESF or ABC values from the standard curve using the QuickCal® analysis template that is provided with the kit.

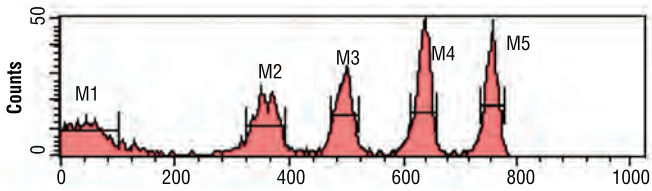
Bangs' Quantum™ kits are uniquely qualified for applications in quantitative fluorescence cytometry:

- Precise MESF or ABC values are assigned to bead populations through meticulous primary calibrations.
- MESF and ABC values provide standardized units of fluorescence intensity. The MESF unit has been formally adopted by NIST and NCCLS as a standardized measure of fluorescence intensity.
- Quantum™ microspheres are labeled with the actual fluorochromes used in flow cytometry, ensuring that quantitative assignments are truly relevant.
- Surface-labeled microspheres are environmentally-responsive; the fluorochrome on the bead responds to the buffer (pH, ionic strength) in the same manner as the fluorochrome on the labeled cell. The fluorescence intensity of beads thus mirrors that of cells, preserving the calibration when quantitative assignments are made.

QuickCal® Analysis Template Instructions

1. Run Quantum™ MESF or Quantum™ Simply Cellular® microspheres on the same day, same instrument, and at the same instrument settings (PMT and compensation) as labeled cell samples.
2. Gate on each peak within the fluorescence histogram.
3. Enter the median channel value of each fluorescence peak against its calibrated MESF or ABC value that appears within the QuickCal analysis template. A calibration curve will appear.
4. Enter median channel values of labeled samples for the automatic assignment of MESF or ABC values from the calibration curve.

See Also PDS 819 or QuickCal Video from BangsLabs.com.



Channel Value from Cytometer

| Marker | % Gated | CV | Median |
|--------|---------|--------|--------|
| M1 | 21.73 | 117.64 | 11.00 |
| M2 | 16.07 | 4.38 | 360.00 |
| M3 | 15.67 | 2.21 | 496.00 |
| M4 | 21.83 | 1.44 | 634.00 |
| M5 | 16.98 | 1.10 | 752.00 |

Channel Value from Cytometer

Bangs Laboratories, Inc. QuickCal v 2.3

Quantum™ MESF Lot# xxxxx Acquisition Date dd/mm/yy
Entry Date dd/mm/yy

| Bead | MESF | Channel |
|---------|--------|---------|
| Blank | | 11 |
| Bead #1 | 4211 | 360 |
| Bead #2 | 15018 | 496 |
| Bead #3 | 53558 | 634 |
| Bead #4 | 158861 | 752 |

Comments:

Instrument

Make/Model:

PMT Setting:

Antibody Used:

Linear Regression: 1.0000

Detection Threshold: 167

| Sample # | Sample Name | Channel | MESF |
|----------|-------------|---------------------|-----------------|
| 1 | Sample 1 | 555 | 25,739 |
| 2 | Sample 2 | 603 | 40,139 |
| 3 | Sample 3 | 568 | 29,031 |
| 4 | | Enter channel value | Data incomplete |
| 5 | | Enter channel value | Data incomplete |
| 6 | | Enter channel value | Data incomplete |
| 7 | | Enter channel value | Data incomplete |
| 8 | | Enter channel value | Data incomplete |
| 9 | | Enter channel value | Data incomplete |
| 10 | | Enter channel value | Data incomplete |

1024 Scale
Calibration Plot (Normalized to 256)

Resulting MESF (or ABC) assignment of stained cell samples

QuickCal® v 2.3 Analysis Template

FLOW APPLICATIONS

CELL CYCLE ANALYSIS

Bangs Laboratories offers a range of microspheres that may be used as standards to support flow cytometric assays in cell proliferation and apoptosis. Beads may be used for routine instrument set-up and QC, or as test-specific standards.

Fluorescence Reference Standards

Products include beads that may be used as single-color fluorescent reference standards, or mixed at specific ratios to achieve different levels of surrogate viable, apoptotic, or dead populations. Several of the actual dyes that are commonly used in cell cycle analysis are represented within our line of Fluorescence Reference Standards, and we additionally offer many fluorescent beads that may be used as spectral surrogates for other stains and indicators. A full listing of Fluorescence Reference Standards can be found on page 72.

| Catalog Number | Description | Unit Size |
|-----------------------|--------------------|--|
| 897 | Acridine Orange | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 906 | DAPI | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 891 | Fluorescein | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 894 | Hoechst 33342 | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |
| 892 | Propidium Iodide | (A) 20 Tests, (B) 100 Tests, (C) 280 Tests |

Please see BangsLabs.com for pricing or contact a local agent.

Viability Dye Compensation Standard

Viability Dye Compensation Standards are suitable for labeling with LIVE/DEAD® stains or other amine-reactive dyes to generate compensation or general reference standards for flow cytometric analyses. Beads are available in two diameters (both supplied at 1e+7 beads/mL) that approximate the sizes of common cell populations. See PDS 853.

| Catalog Number | Description | Unit Size |
|-----------------------|--|------------------|
| 450 | Viability Dye Compensation Standard, 4µm | 3mL |
| 451 | Viability Dye Compensation Standard, 8µm | 3mL |

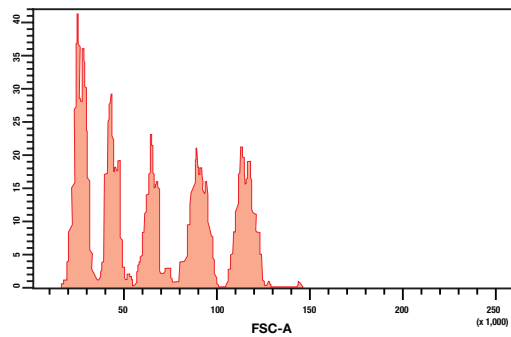
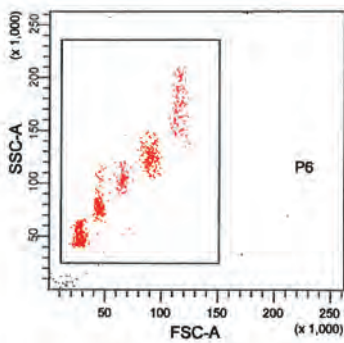
Please see BangsLabs.com for pricing or contact a local agent.

CELL SIZE ESTIMATION

Though flow cytometers are not particle sizers, *per se*, they are frequently used to estimate cell size. Our various size range kits, with particles spanning from 50nm - 11 μ m, can aid in exploring cytometer capabilities and in optimizing instrument configuration for the analysis of cellular and sub-cellular particles. See also our NIST Traceable Size Standards (page 92 - 93) for additional options.

Size Calibration Standards Kit

The Size Calibration Standards Kit is comprised of five populations of undyed microspheres in the range of ~4 – 11 μ m. Forward scatter channel (FSC) values may be plotted against reported bead diameter to generate a curve that may be used for estimation of the sizes of cells run at the same instrument settings. See PDS 829.



| Catalog Number | Description | Unit Size |
|----------------|--|--------------------------------|
| 829 | Size Calibration Standards Kit (~4 – 11 μ m) | (B) 100 Tests or (C) 280 Tests |

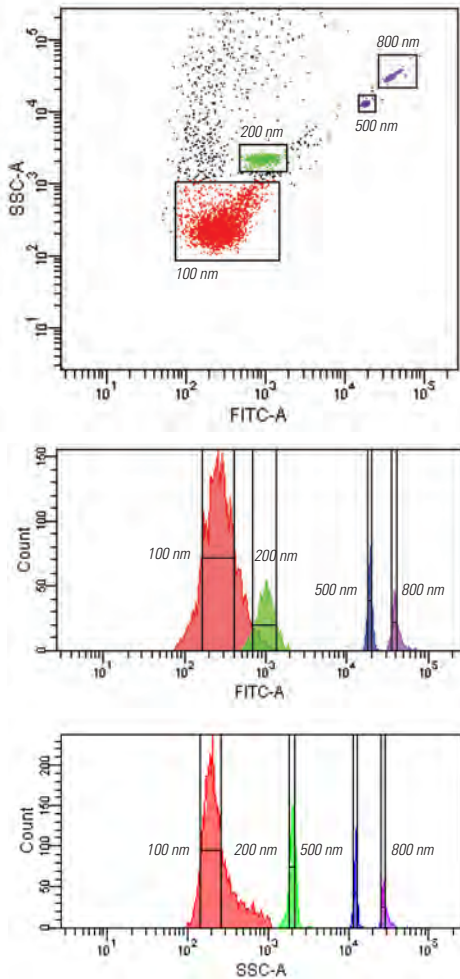
Please see Bangslabs.com for pricing or contact a local agent.

FLOW APPLICATIONS

SMALL PARTICLE ANALYSIS

Current applications in flow cytometry extend far beyond traditional lymphocyte immunophenotyping, with some involving the analysis of very small particles such as exosomes, microvesicles, or platelet- and endothelial-derived microparticles or microbial species. Our Small Bead Calibration Kits allow operators to verify the resolution capabilities of the flow cytometer, and to establish appropriate instrument settings for analyses of small particles such as exosomes and microparticles.

Nanobead kit & Submicron kit



Small Bead Calibration Kits

The dot plot and histograms (left) demonstrate results obtained on a standard BD™ LSRII. The resolution capabilities of instruments can differ, and results may vary depending upon the specific instrument model and any specialized components. Microspheres are internally dyed with our YG fluorophore, permitting gating via SSC / green fluorescence. Small particles present particular challenges in flow cytometry, and users may or may not be able to conduct FSC (size) - based gating. It may also be necessary to adjust thresholds and voltages to achieve separation of the populations. See PDS 832 and 834 for detailed tips and troubleshooting list for running submicron particles.

| Catalog Number | Description | Unit Size |
|----------------|--|-----------|
| 834 | Nanobead Calibration Kit - 50nm, 100nm | 3mL |
| 832 | Submicron Bead Calibration Kit - 0.2µm, 0.5µm, 0.8µm | 3mL |
| 833 | Micron Bead Calibration Kit - 1.0µm, 3.0µm, 6.0µm | 3mL |

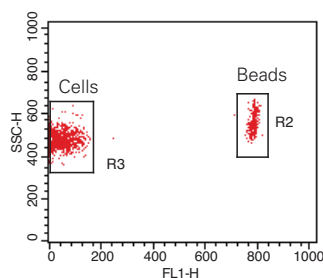
Please see BangsLabs.com for pricing or contact a local agent.

CELL COUNTING

Though the application of particle counting technology is diverse, there is a common need for instrument validation and ongoing QC. Microsphere-based particle count standards may be used to validate liquid counters across their dynamic ranges and to ensure continued capability through the performance of daily QC checks. The use of a reference material permits the standardization of results between runs, instruments and laboratories, and over time. Our particle count standards include both general and instrument-focused (flow cytometer, cell viability analyzer) controls, and we can customize products to meet the needs of your program.

Flow Cytometry Absolute Count Standard™

Our Flow Cytometry Absolute Count Standard is a precisely-counted population of microspheres (~1e⁶ beads/mL) for estimating the concentrations of unlabeled cells via flow cytometry. Beads are dyed with multiple fluorophores for excitation with common lasers (e.g. 488nm, 633nm) and discrimination from the cell population. By evaluating the ratio of microspheres to cells, the volumetric number of cells may be determined. See PDS 880.



| Catalog Number | Description | Unit Size |
|----------------|--|-----------|
| 580 | Flow Cytometry Absolute Count Standard | 10mL |

Please see BangsLabs.com for pricing or contact a local agent.

SureCount™ Particle Count Standards

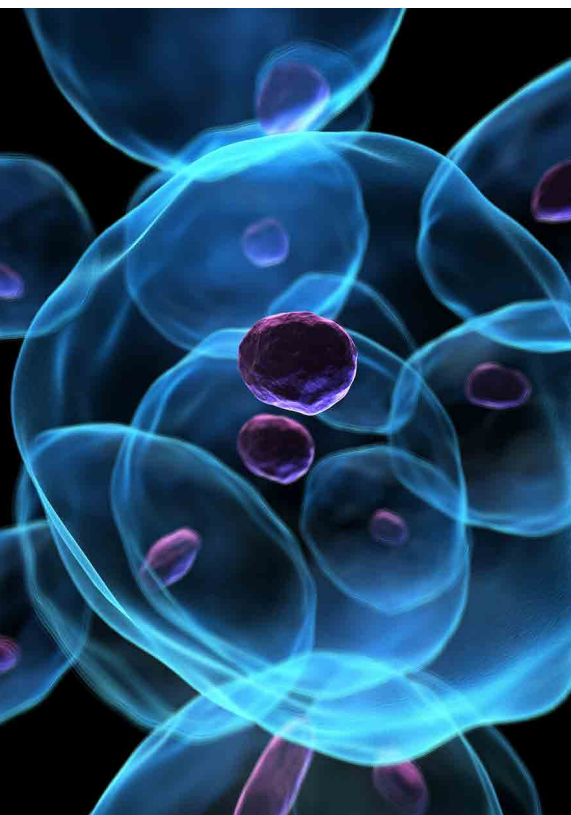
SureCount beads are suspensions of polymer microspheres intended to aid in particle counting methods and their supporting sample preparation processes. They complement our other count and concentration controls, and may be used with flow cytometers or other counters when a dyed bead is not required. SureCount standards are available in four sizes (3µm, 5µm, 10µm, or 15µm), with diameters traceable to NIST Standard Reference Materials. The standards are supplied as ~1 × 10⁶ microspheres/mL aqueous suspensions. See PDS 733 and TSD 0706.

| Catalog Number | Description | Unit Size |
|----------------|---|-----------|
| CC03N | SureCount Particle Count Standard, 3µm | 10mL |
| CC05N | SureCount Particle Count Standard, 5µm | 10mL |
| CC10N | SureCount Particle Count Standard, 10µm | 10mL |
| CC15N | SureCount Particle Count Standard, 15µm | 10mL |

Please see BangsLabs.com for pricing or contact a local agent.



CELL VIABILITY & CONCENTRATION STANDARDS



ViaCheck™ Cell Viability and Concentration Controls

Viability and concentration determinations are integral to the cell culture technologies used in recombinant protein production and a wealth of research and diagnostic applications. Methods for determining cell viability and counts may rely on visible dye (trypan blue, page 51) exclusion and imaging using a hemocytometer or automated analyzer (e.g. Vi-CELL®), or cell labeling with membrane-impermeable fluorescent dyes (propidium iodide, DAPI, Hoechst, LIVE/DEAD) with flow cytometric analysis (see page 86).

Our ViaCheck Cell Viability and Concentration Controls complement our extensive line of microsphere standards for instrument QC. ViaCheck standards mimic the light scattering characteristics of live and dead cells in the trypan blue dye exclusion method, and may be used to confirm the capabilities and verify the performance of image-based cell viability instruments (e.g. Vi-CELL®). The standards are available in a range of common concentrations and live/dead ratios. See PDS 706, 711 and TSD 0706.

| Catalog Number | Description | Unit Size |
|----------------|---|-----------|
| VC10B | ViaCheck 0% Viability Control | 20mL |
| VC25B | ViaCheck 25% Viability Control | 20mL |
| VC20B | ViaCheck 50% Viability Control | 20mL |
| VC30B | ViaCheck 75% Viability Control | 20mL |
| VC40B | ViaCheck 90% Viability Control | 20mL |
| VC50B | ViaCheck 100% Viability Control | 20mL |
| VC60N | ViaCheck Concentration Control (1 x 10 ⁶) | 20mL |
| VC70N | ViaCheck Concentration Control (4 x 10 ⁶) | 20mL |
| VC80N | ViaCheck Concentration Control (8 x 10 ⁶) | 20mL |

Please see BangsLabs.com for pricing or contact a local agent.

ViaCheck™ SingleShots™

ViaCheck SingleShots provide trusted and affordable single-use QC. Mix, dispense & run for confirmation of live/dead ratios and counts. ViaCheck SingleShots minimize error and maximize efficiency by circumventing potential human error from repeated bottle resuspension & pipetting steps. See PDS 706, 711 and TSD 0706.

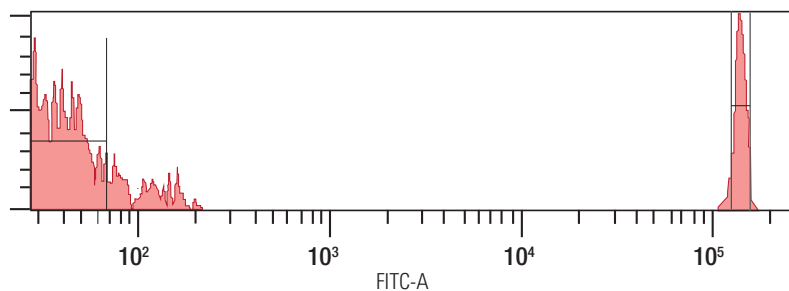


| Catalog Number | Description | Units |
|----------------|--|----------|
| VC10BSS | ViaCheck 0% Viability Control | 25 or 75 |
| VC25BSS | ViaCheck 25% Viability Control | 25 or 75 |
| VC20BSS | ViaCheck 50% Viability Control | 25 or 75 |
| VC30BSS | ViaCheck 75% Viability Control | 25 or 75 |
| VC40BSS | ViaCheck 90% Viability Control | 25 or 75 |
| VC50BSS | ViaCheck 100% Viability Control | 25 or 75 |
| VC60NSS | ViaCheck Concentration Control (1×10^6) | 25 or 75 |
| VC70NSS | ViaCheck Concentration Control (4×10^6) | 25 or 75 |
| VC80NSS | ViaCheck Concentration Control (8×10^6) | 25 or 75 |

Please see BangsLabs.com for pricing or contact a local agent.

Viability Dye Compensation Standards

Viability Dye Compensation Standards are suitable for labeling with LIVE/DEAD® stains or other amine-reactive dyes to generate compensation or general reference standards for flow cytometric analyses. See PDS 853.



| Catalog Number | Description | Unit Size |
|----------------|--|-----------|
| 450 | Viability Dye Compensation Standard, 4µm | 3mL |
| 451 | Viability Dye Compensation Standard, 8µm | 3mL |

Please see BangsLabs.com for pricing or contact a local agent.

SIZE STANDARDS

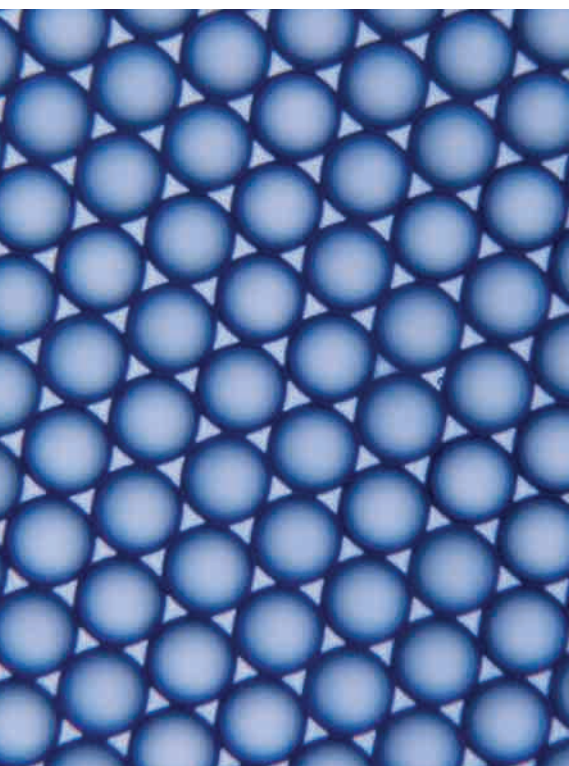
Size standards may be used to validate particle sizers across their dynamic ranges. They are suitable for use in the performance of routine instrument calibration checks and corrections, and in the support of practice standards, such as those published by ISO, ASTM International, CEN, and others. Additionally, the use of a reference material permits the standardization of results between runs, instruments, laboratories, and over time.

| | |
|-----------------------------------|-------------|
| Composition | Polystyrene |
| Refractive Index (589nm) | 1.59* |
| Density (g/cm³) | 1.05* |

* Reported value for bulk polymer.

NIST Traceable Particle Size Standards

Our NIST Traceable Particle Size Standards are monodisperse polystyrene spheres available in diameters ranging from 40nm – 175µm. Suspensions are conveniently packaged in dropper bottles at 1% solids, and each bottle is provided with a Certificate of Traceability. See TN 105, Microsphere Size Standards and PDS 734.

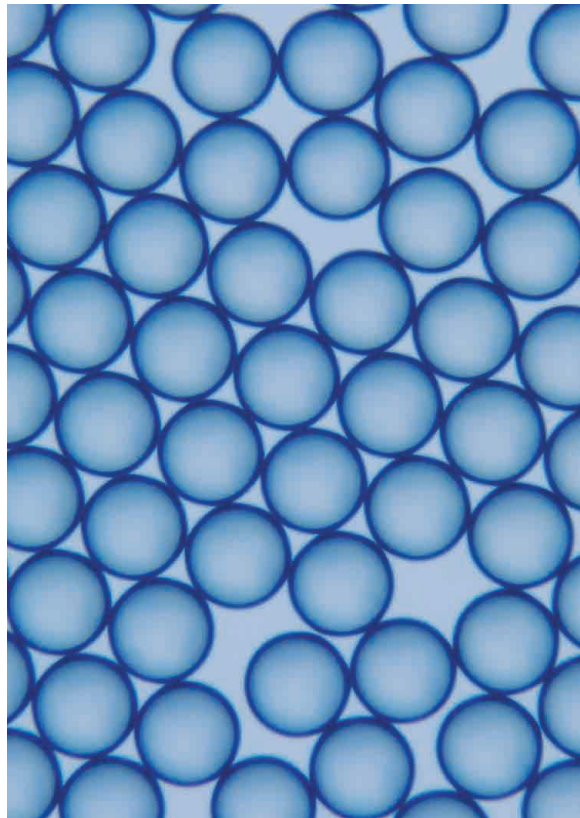


| Catalog Number | Nominal Diameter | Unit Size |
|-----------------------|-------------------------|------------------|
| NT02N | 0.04µm | 15mL |
| NT03N | 0.06µm | 15mL |
| NT04N | 0.08µm | 15mL |
| NT05N | 0.10µm | 15mL |
| NT06N | 0.15µm | 15mL |
| NT07N | 0.20µm | 15mL |
| NT08N | 0.30µm | 15mL |
| NT09N | 0.40µm | 15mL |
| NT10N | 0.50µm | 15mL |
| NT11N | 0.60µm | 15mL |
| NT12N | 0.70µm | 15mL |
| NT13N | 0.80µm | 15mL |
| NT14N | 0.90µm | 15mL |
| NT15N | 1.00µm | 15mL |
| NT16N | 1.50µm | 15mL |
| NT17N | 2.00µm | 15mL |
| NT18N | 2.50µm | 15mL |
| NT19N | 3.00µm | 15mL |
| NT20N | 3.50µm | 15mL |

Please see BangsLabs.com for pricing or contact a local agent.

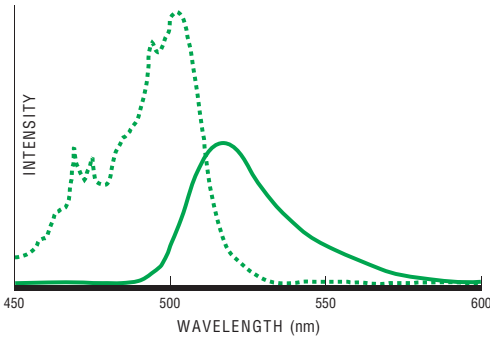
| Catalog Number | Nominal Diameter | Unit Size |
|----------------|------------------|-----------|
| NT21N | 4.00µm | 15mL |
| NT22N | 5.00µm | 15mL |
| NT23N | 6.00µm | 15mL |
| NT24N | 7.00µm | 15mL |
| NT25N | 8.00µm | 15mL |
| NT26N | 9.00µm | 15mL |
| NT27N | 10.00µm | 15mL |
| NT28N | 12.00µm | 15mL |
| NT29N | 15.00µm | 15mL |
| NT30N | 20.00µm | 15mL |
| NT31N | 25.00µm | 15mL |
| NT32N | 30.00µm | 15mL |
| NT33N | 40.00µm | 15mL |
| NT34N | 50.00µm | 15mL |
| NT35N | 60.00µm | 15mL |
| NT36N | 80.00µm | 15mL |
| NT37N | 100.00µm | 15mL |
| NT38N | 125.00µm | 15mL |
| NT39N | 150.00µm | 15mL |
| NT40N | 175.00µm | 15mL |

Please see BangsLabs.com for pricing or contact a local agent.

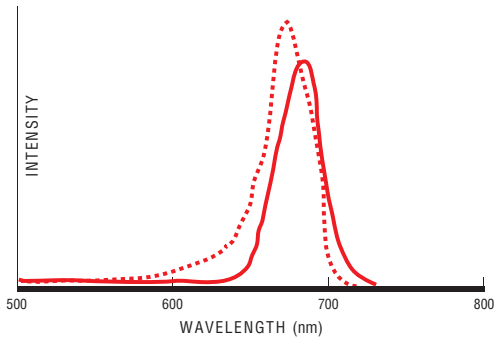


FLUORESCENCE IMAGING STANDARDS

Dragon Green (480, 520)



Flash Red (660, 690)



Fluorescence Intensity Standard Kits

Fluorescence intensity standards have many applications both in instrument QC programs and in biological analyses.

We offer two intensity standard sets for these applications. Both the Dragon Green and Flash Red kits consist of five suspensions of ~8µm polystyrene-based microspheres dyed with increasing amounts of their respective fluorophore. Dragon Green is an excellent spectral surrogate for fluorescein and is suitable for use with fluorescein filter sets. As Flash Red is spectrally similar to Cy™5, traditional red fluorophore filter sets (e.g. Cy™5 for the microscope; PE-Cy™5 or APC on the cytometer) may be used with this standard.

The different intensity populations may serve as relative intensity standards for applications in fluorescence microscopy, where, as internally-dyed beads, they will stand up to the rigors of imaging. The beads may also serve as bright relative intensity or linearity standards for flow cytometry; ask about our QuickCal® Linearity Template if this is your interest. See PDS 704.

| Catalog Number | Description | Unit Size |
|----------------|---|---------------------|
| DG06M | Dragon Green Intensity Standard (5 intensities) | 1mL × 5 populations |
| FR06M | Flash Red Intensity Standard (5 intensities) | 1mL × 5 populations |

Please see BangsLabs.com for pricing or contact a local agent.

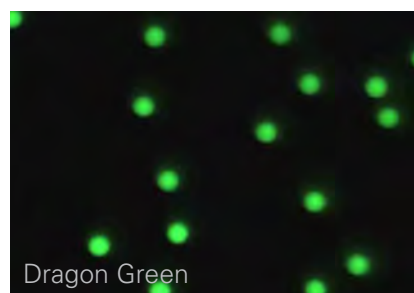
FLUORESCENCE MICROSCOPE CALIBRATION

StarLight™ Calibration Slides

StarLight Calibration Slides are mounted with vibrant ~6µm fluorescent microspheres dyed with a single fluorophore for basic imaging checks and calibration for fluorescence microscopes. Our four standard versions are appropriate for use with common microscope filter sets: Glacial Blue (360, 450), Dragon Green (480, 520), Envy Green (525, 565), and Flash Red (660, 690). The calibration slides are available individually or as the full 4-slide collection. See our general use fluorescent microspheres on pages 20 - 25.

| Catalog Number | Description |
|----------------|---|
| SL1GB | StarLight Calibration Slide – Glacial Blue (1 slide) |
| SL1DG | StarLight Calibration Slide – Dragon Green (1 slide) |
| SL1EG | StarLight Calibration Slide – Envy Green (1 slide) |
| SL1FR | StarLight Calibration Slide – Flash Red (1 slide) |
| SL04K | StarLight Collection – Slide 4-Pack (1 slide of each color) |

Please see BangsLabs.com for pricing or contact a local agent.



TRADEMARKS

To the best of our knowledge, the trademarks listed here are accurate as of the printing of the catalog.

Bangs Laboratories, Inc.

Absolute Count Standard™, Autofluor™, Bangs Laboratories, Inc.™, Bind-IT™, Certified Blank™, COMPEL™, Full Spectrum™, Latex Course™, Magnefy™, Painless Particles®, ProActive®, QC Windows®, Quantum™, QuantumPlex™, QuickCal®, Right Reference Standard™, Simply Cellular®, Starfire Red™, StarLight™, SuperAvidin™, SureCount™

Beckman Coulter

Vi-CELL®

BD Biosciences

BD™ LSRII

Dow Chemical Company

Triton™

GE Healthcare Limited

Cy™, including Cy5 and Cy7, is a trademark of GE Healthcare Limited. These products are manufactured under license from Carnegie Mellon University under U.S. Patent Number 5,268,486 and related patents.

ICI Americas, Inc.

Tween®

Life Technologies Corporation

Alexa Fluor®, LIVE/DEAD®, SYTOX®, Texas Red®, Pacific Blue™

Norit NV

NORIT®

Polysciences, Inc.

Beads Above the Rest™, BioMag®, BioMag®Plus, Polysciences, Inc.®, ProMag®, SingleShots™, SingleShot™, SNARe™, ViaCheck™

Sartorius AG Corporation

Vivaspin® is a registered trademark of Sartorius AG Corporation.

TERMS AND CONDITIONS

PAYMENT: Payment is expected 30 days after the invoice date. Payment must be made in U.S. dollars, with checks being drawn on a U.S. Bank. International money orders and VISA/MasterCard are also accepted. If payment is made by one of these credit cards, a card number, expiration date, and name as printed on the card must be included. Prices are subject to change by BLI without notice.

SHIPPING: Shipments will be made FCA, Fishers, IN; freight and insurance charges will be prepaid by Bangs and added to your invoice amount. BLI's primary courier within the U.S. is UPS; however, other carrier services may be used upon your request. Outside the U.S., BLI ships via UPS International, DHL, or Federal Express International. Should Federal Express International be preferred, you will need to provide BLI with the appropriate Federal Express account number for duties and invoice purposes. Duties and customs fees are the responsibility of the receiver. BLI agrees to cooperate with, and assist, you in the presentment of any claim for product damaged or lost in transit with the applicable insurance carrier.

USE: All product is intended for *in-vitro* Research Use only. All directions concerning use of the product, given in technical publications or by technical services, are intended as guidance only. Except as otherwise specified in the Certificate of Analysis, which is incorporated herein and made a part of this Terms and Conditions of Sale, no license is either granted or implied by the sale of any product to you.

WARRANTY: BLI warrants that for a period of thirty (30) days from the shipment date of the product to you (the "Warranty Period") only that such product shall be free from defects in workmanship and materials and shall reasonably conform to the description of such product as set forth in the Certificate of Analysis which accompanies each product.

LIMITATION OF WARRANTY: Except as otherwise provided in the "Use" section above, BLI makes no warranty that the use of these products will not infringe upon the intellectual property rights of any third party. THE FOREGOING WARRANTY AND THE OBLIGATIONS AND LIABILITIES OF BLI THEREUNDER, ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, GUARANTEES, OR LIABILITIES, EXPRESSED OR IMPLIED, ARISING BY LAW OR OTHERWISE INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The warranty obligations of BLI shall apply only if you make a warranty claim during the Warranty Period and such claim is made in accordance with the warranty claim procedure set forth below.

WARRANTY CLAIMS: If a product has a defect in materials and/or workmanship or fails to reasonably conform to the description of such product as set forth in the Certificate of Analysis accompanying each product during the Warranty Period, BLI will either refund to you the purchase price of the product or replace such product, minus a restocking fee of 20% of the product value. To properly make a warranty claim, you must call BLI's Customer Service at (317) 570-7020 prior to the expiration of the Warranty Period. BLI will issue you a Return

Authorization Number and instructions on the processing of the warranty claim. BLI will not accept returns without a completed Return Authorization form faxed back to our Customer Service Department.

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APPLICABLE LAW: The validity of these Terms and Conditions of Sale, as well as their interpretation and construction, shall be governed by Indiana law.

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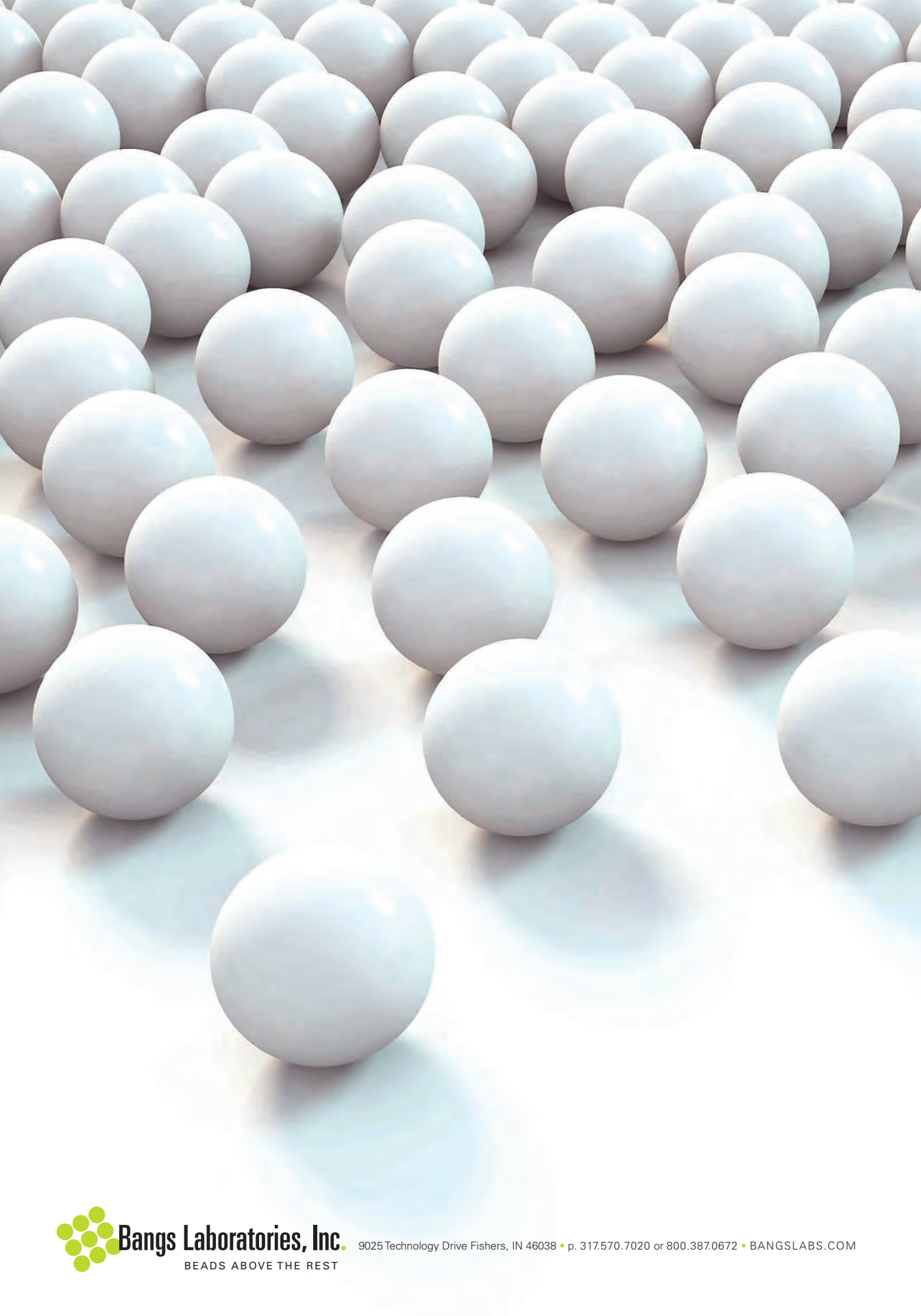


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