News | Views | Insights *from...*

Polysciences, Inc.
Chemistry beyond the ordinary

PolyFacts
Microspheres / Particles

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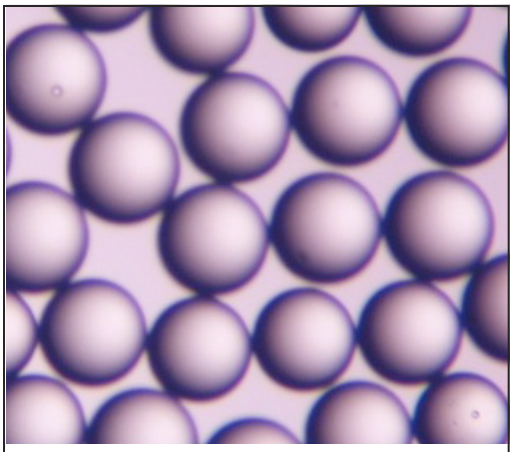
(Bigger and) Better than Ever...
The Wonderful World of Polystyrene

For years, Polysciences has been known for our extensive catalog of high-quality polystyrene microspheres. Our beads have been used in the life sciences for applications including diagnostics and bioseparations, and as instrument and process standards.

Our offerings include the smallest diameters for nanotech applications, and extend to ~100µm and beyond for pursuits requiring large beads. We also have over fifty polystrene NIST-traceable size standards in diameters ranging from 40nm - 175µm.



Polybead®, 90µm

The **Polybead®** line features functionalized (COOH, NH_2) and non-functionalized microspheres, in addition to affinity ligand-coated microspheres for simplified binding. We also have an impressive line of visibly dyed and fluorescent beads.

Within our standard catalog, products are sold in economical package sizes that provide ample material for initial trials, without breaking the bank. We also offer a range of custom services and bulk manufacturing.

Take a look at our big catalog of (little and big) beads – you'll be glad you did. And of course, we'll be glad too.

Have you seen our new website yet? Check out Page 4 for more details...

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The Ultimate Question of Life, the Universe and Everything....

or How to Choose a Bead from the Staggering Number of Choices

Choosing the right microsphere for assay development is no small matter. As this reagent will be responsible for presenting ligand to sample for target capture, it must possess suitable specific and nonspecific binding characteristics. Once coated, the active surface will contribute to dynamic range and sensitivity, and its stability will directly affect shelf life of the finished test. There's also a good chance that other factors, such as physical density and optical properties, will be important. But no pressure. Really.

Fortunately, there are many product options that will ensure that basic requirements are met, and permit tailored performance from there. So many, that test developers can factor matrix, diameter, surface characteristics and optical properties into bead selection. So many, in fact, that, short of having unrestricted access to a Magic 8-Ball® (www.mattel.com), navigating them can be a bit ticklish.

But never fear – we stand ready to help! Our new Technical Data Sheet #778, *Microsphere Selection*, will bring you up to speed, and our Sampler Kits will facilitate the bead vetting process without turning a blind eye to the budget. We have loads of options for kits containing polymer beads of different sizes, surface chemistries, visible dyes and fluorophores. And BioMag® superparamagnetic particle kits? Don't even get us started....

So tuck away that 8-Ball, and give us a ring!

Sizes and Surface Chemistries

19822 Polybead® Sampler Kit I
0.5µm, 0.75µm, 1.0µm, 2.0µm and 3.0µm

21756 Polybead® Sampler Kit II
0.1µm, 0.2µm, 0.5µm and 1.0µm

16905 Polybead® Sampler Kit III
0.05µm, 0.20µm, 0.50µm, 1.00µm, 45.0µm and 90.0µm

19819 Polybead® Carboxylate Sampler Kit I
0.5µm, 0.75µm, 1.0µm, 2.0µm and 3.0µm

21757 Polybead® Carboxylate Sampler Kit II
0.1µm, 0.2µm, 0.35µm and 0.5µm

19820 Polybead® Amino Sampler Kit
0.5µm, 0.75µm, 1.0µm and 3.0µm

24350 PolyLink Protein Coupling Kit for Carboxylate Microspheres

19540 Glutaraldehyde Kit for Amino and Blue Dyed Microspheres

Colors and Fluorophores

18326 Fluoresbrite® Carboxylate Color Range Kit I
1.75µm, 6 different fluorescent bead populations

19839 Fluoresbrite® Carboxylate Color Range Kit II
0.5µm, 6 different fluorescent bead populations

16906 Polybead® Dyed Microsphere Kit I
1 undyed and 4 different visibly dyed bead populations

19821 Polybead® Blue Dyed Microsphere Sampler Kit
0.2µm, 0.5µm, 1.0µm and 3.0µm

Did We Mention BioMag®?

Seriously – check out our website!

For a complete listing of all your microsphere options, please visit our website at www.polysciences.com.

Figure 1: *Polybead® Carboxylate Dyed Microspheres*

Figure 2: *PolyLink Protein Coupling Kit for Carboxylate Beads*

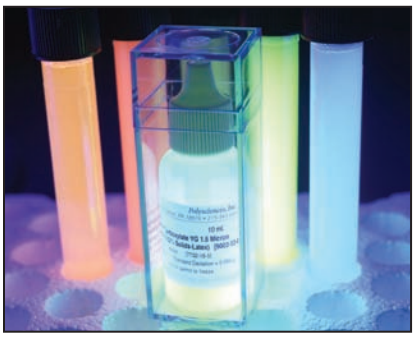


Figure 3: *Fluoresbrite® Carboxylate Fluorescent Microspheres*

Figure 4: *BioMag® Magnetic Immobilization Kit*

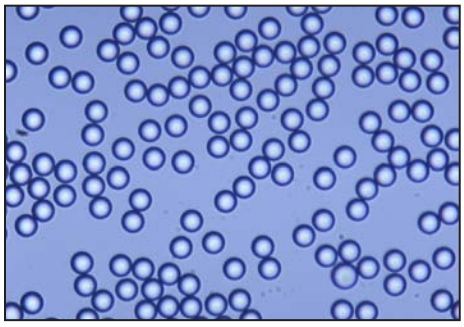
Particle Perplexities

Questions & Answers pertaining to Polysciences' Microspheres / Particles

Q: I'm having trouble with bead stickiness when working with polystyrene beads in a carbonate buffer, pH ~9.8. I understand that SDS is most soluble at high pH (~9-10), and I'm guessing that the surfactant is coming off of the bead surface at this pH. I have thought about using Tween® 20, but I have read that ideal pH is 6.5-7.5.

Do you have any thoughts regarding a surfactant that would be good for pH 9.8?

A: Nonionic surfactants are much less sensitive to changes in pH than are anionic surfactants, such as SDS. We would suggest trying Triton™ X-405 or IGEPAL® CO-890 as alternatives.



Example of well-dispersed 10µm Polybead® microspheres.

Q: I want to bind an $-NH_2$ terminated ligand to carboxylated polystyrene spheres, and was wondering what buffer I should use for coupling. Does it matter?

A: When selecting a coupling buffer, the main concerns are generally to keep the biomolecule happy and to select a suitable pH for the reaction. The buffer should also be free of compounds that would interfere or compete with the reaction or ligand, e.g. buffers containing free amines, such as Tris. Borate or carbonate buffers are often used for coupling, though you should consider a lower-pH buffer (e.g. MES) when using a one-step EDAC-based procedure. And, if you don't have the time or inclination for buffer screening, you might consider using our PolyLink Protein Coupling Kit for Carboxylate Particles (Cat. #24350).

The PolyLink Protein Coupling Kit is intended for the covalent coupling of proteins to carboxylated microspheres and contains a procedure that has been optimized for polymer microspheres 1µm or larger. The kit includes EDAC, coupling buffer, and wash / storage buffer sufficient for 50 reactions using ~200-500µg protein and 12.5mg COOH-functionalized microspheres per reaction.

When working with microspheres 0.1-0.5µm in diameter, we offer the same kit reagents as our standard PolyLink Kit and also include a hollow fiber separation device to aid in the washing and isolation steps. For microspheres less than 0.1µm, we suggest using dialysis tubing or centrifugal filtration devices.

Cat. No.	Description
24350	**PolyLink Protein Coupling Kit for Carboxylate Microspheres**
24818	**PolyLink Kit with Hollow Fiber Filtering System**

Q: I was hoping you could educate me a bit on solubility parameters for polymers. From Leigh Bangs' general writings ("Uniform Latex Particles"), I understand that near-matches in solubility parameters between a polymer and solvent indicate that it will efficiently dissolve the polymer. However, in looking up solubility parameters on the Internet, I've come across several different types, e.g. Standard Hildebrand Values, SI Hildebrand Values, and Hansen Solubility Parameters. Is there a preferred parameter and what is the general rule associated with it?

One more question: is hydrofluoric acid expected to damage polystyrene with a low level of crosslinking? Do acids follow the same rules as organic solvents?

A: The Hildebrand solubility parameter is usually regarded as the preferred one. Standard Hildebrand and SI Hildebrand solubility parameters are made equivalent through the use of a conversion factor:

$$1\ (MPa^{1/2}) = 0.48888\ (cal^{1/2}) / (cm^{3/2})$$

We have typically used the standard solubility parameter values, since much of the older literature uses standard (English) units. In this case, the rule of thumb for solubility of a polymer in a solvent is that the solubility parameter values are within 1 unit of each other or less. Of course, chemistry doesn't always behave as we expect it to, so this is only a general rule.

The Hildebrand solubility parameter can be calculated from the 3 Hansen solubility parameters (i.e., dispersion, polar, and hydrogen bonding parameters):

$$d\ (Hildebrand) = (d_d^{1/2} + d_p^{1/2} + d_h^{1/2})^{1/2}$$

Acids don't always follow the solubility parameter principle, since they don't necessarily dissolve material, they react chemically with it. (Of course, some acids, like acetic acid, are also organic solvents, and would dissolve polymers within their solubility parameter range.)

The literature indicates that polystyrene is generally resistant to hydrofluoric acid, except under harsh conditions (high concentration, elevated temperature, etc.). The degree of crosslinking would not affect the resistance of the polymer to hydrofluoric acid.

Our New Look!

The Launch of our New Website

Polysciences is pleased to announce the launch of our new website. In order to provide you with an easier and more secure online experience, we redesigned our web site and are thrilled to announce its completion. Of course, if you've visited the website recently, still located at **www.polysciences.com**, you have already noticed the dramatic difference. For those of you who haven't visited us lately, wait until you see what we have in store for you!

For starters, with an increased search functionality, as well as a highly structured navigation system, we're sure that you'll find whatever products or information you need – quickly and easily.

Not only did we simplify our search function, but also increased the amount of information available to you online. Our catalog, newsletters, Technical Data Sheets, and Material Safety Data Sheets are all available in our **Technical Information** section. Sound daunting? Never fear. We've simplified that too. Most of the products you seek will have links from the product page to the information you need– immediately available for downloading.

Have a question? Need to contact us? Don't be shy! Let us know what you think about our new website and our products. Don't forget – we're here for you. Ask your questions too. We are here to help – and we're only a simple click away!

Not in the United States? Where do you find our products? Check out our **Distributor** page to find not only your nearest distributor, but their email and website information. Just one click takes you directly to their inbox or website!

So see what the excitement is all about. Visit our website at **www.polysciences.com** today. We hope you like it, too!

Confidence Comes Standard

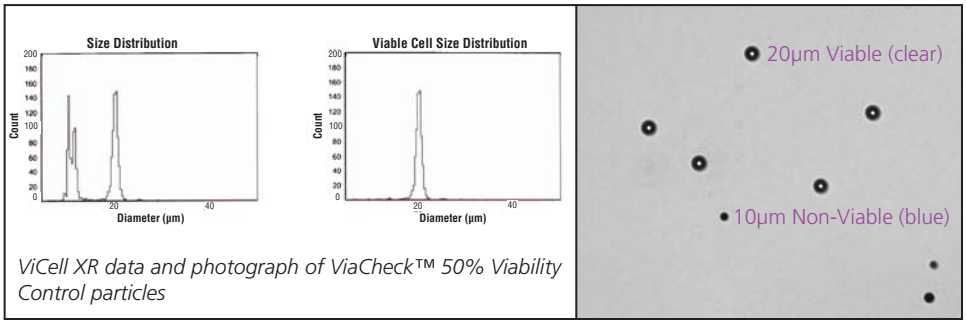
ViaCheck™ Viability Instrument Standards

Instrumental methods for cell viability analysis provide significant advantages over manual determinations, offering high accuracy, precision and throughput. However, as with any analytical instrument, it is important to implement a QC program to ensure confidence in results.

ViaCheck™ Viability Instrument Standards can provide just that confidence. ViaCheck™ Viability products are microsphere-based standards that mimic the light scattering characteristics of "live" and "dead" cells in the trypan blue exclusion method, and may be used to confirm the capabilities and verify the performance of image-based cell viability instruments.

For more information about our ViaCheck™ products, visit us at **www.polysciences.com**.

Cat. No.	ViaCheck™ Description
24622	**0% Viability Control**
24623	**50% Viability Control**
24624	**75% Viability Control**
24625	**90% Viability Control**
24626	**100% Viability Control**



ViCell XR data and photograph of ViaCheck™ 50% Viability Control particles