Estapor® White Microspheres

The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the U.S. and Canada.

Sigma-Aldrich®
Lab & Production Materials

White Microspheres from MilliporeSigma

For more than 40 years, with trade starting in 1975, the dedicated and specialized Estapor® team has been supplying polymeric raw materials to the *in vitro* diagnostic (IVD), life science, biotechnology, cosmetic, electronic and environment markets. Our microspheres and nanospheres are used worldwide in **millions of assays** each year for commercial products (FDA, CE and CFDA approved) made by internationally known and local brands.

Figure 1. Estapor® plant (above) and laboratories (bottom right) located in Meyzieu, France (Lyon area).

As part of the oldest chemical company in the world, our Estapor® team has access to all the latest innovations, allowing us to regularly deliver new products to the market. We are committed to consistently providing our worldwide partners with the highest quality microspheres, nanospheres and particle products available, delivered with the maximum level of technical assistance.

Based near Lyon, France (**Figure 1**), our dedicated modern laboratory and industrial facilities can produce from **gram to industrial (kg) scale (Figure 2)** according to the following quality standards:

- ISO 9001:2015 (Quality)
- ISO 14001:2015 (Environmental)
- OHSAS 18001:2007 (Health and Safety)

Figure 2. Estapor® Microspheres can be manufactured and shipped in the quantities you require, from gram to **industrial scale**.

Customer advantages

Time saving

Avoid retesting batches or lots, saving you precious time and money. Your approved raw materials can be securely kept in our exclusive storage area for your later use.

Diverse portfolio

Access one of the largest and most diverse portfolios available in the industry. Includes white, dyed, fluorescent and magnetic microspheres with many possible chemical functional groups.

Reliable supply

Have confidence in a reliable supply source based on quality and our long-standing history.

Extensive knowledge

Benefit from the extensive knowledge and know-how of our specialized and dedicated technical team.

Custom products

Custom development in terms of particle size, density, surface functional groups and color. Our experience in nanospheres and microspheres allows our R&D department to quickly and inexpensively develop custom products.

Estapor® Standard Microspheres and Nanospheres

Our standard polystyrene-based spheres are extremely uniform (**Figure 3**) with excellent lot-to-lot reproducibility. These products are mainly devoted to hydrophobic or passive immobilization of molecules (polyclonal or monoclonal antibodies, proteins, haptens, etc.) onto their surface.

We offer a large range of sizes (from about 20 nm to 6 µm and more), suitable for most microsphere-based technologies (**Table 1**), including:[1,3-5]

- Immunoturbidimetric assays
- Nephelometric assays
- Enhanced immunoturbidimetric assays
- Latex agglutination tests (LAT) (**Figure 4**)[4]
- Solid phase immunoassays
- ELISA capture immunoassay
- Calibration

Except in specific cases products are supplied at 10% concentration in water (1g/10g).

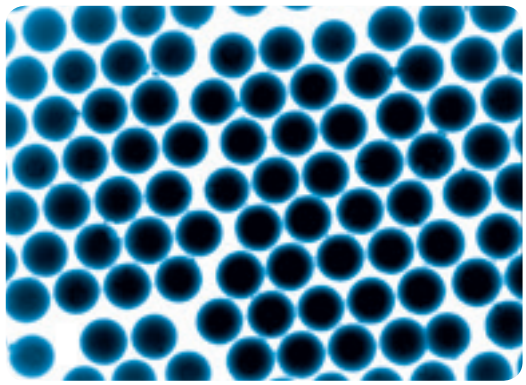

Figure 3. TEM view of Estapor® Microspheres (K080).

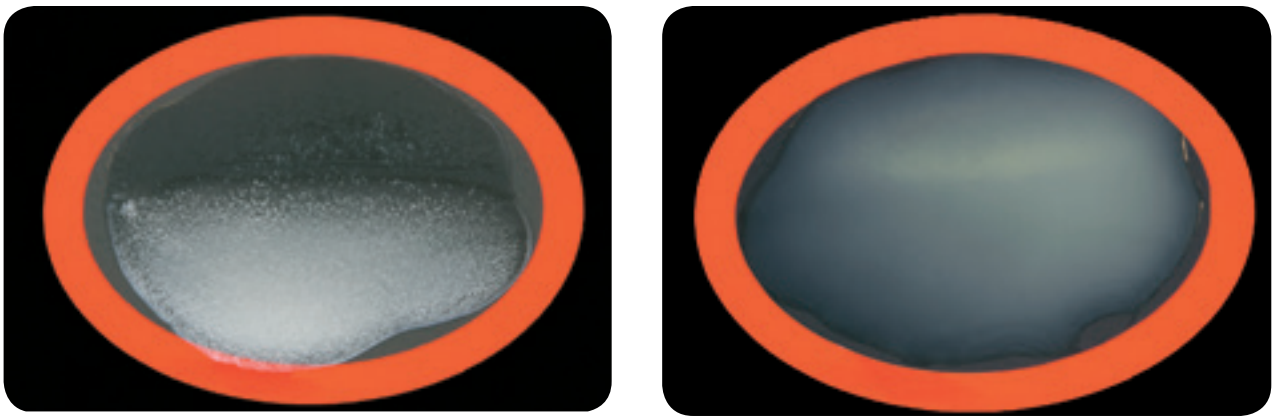

Figure 4. Latex agglutination test (LAT) on slide using white Estapor® Microspheres (K080), left (+), right (-).

Table 1. Examples of IVD applications using Estapor® Microspheres and Nanospheres. Recommended approximate size range.

Application	Estapor® White (size in µm)
Immunoturbidimetry (IT)	0.050-0.400
Immunonephelemtry (IN)	0.050-0.400
Latex agglutination test (LAT)	0.200-3.000

Estapor® Standard Polystyrene Microspheres and Nanospheres (adsorption)

Small Standard Estapor® Nanospheres

Product	Diameter (µm)	Polymer	Cat. No.
K005	< 0.050	Polystyrene	**39 502 001**
K007	0.050-0.080	Polystyrene	**39 431 081**
K010	0.081-0.125	Polystyrene	**39 469 081**

Medium Standard Estapor® Microspheres

Product	Diameter (µm)	Polymer	Cat. No.
K015	0.126-0.175	Polystyrene	**27 712 084**
K020	0.176-0.225	Polystyrene	**39 430 087**
K025	0.226-0.275	Polystyrene	**23 689 083**
K030	0.276-0.325	Polystyrene	**23 690 087**
K035	0.326-0.375	Polystyrene	**39 380 084**
K040	0.376-0.425	Polystyrene	**23 691 081**
K045	0.426-0.475	Polystyrene	**39 503 001**
K050	0.476-0.575	Polystyrene	**80 380 151**
K060	0.576-0.649	Polystyrene	**80 380 171**
K070	0.650-0.740	Polystyrene	**23 715 084**
K080	0.750-0.890	Polystyrene	**23 692 084**
K100	0.910-1.100	Polystyrene	**23 716 087**

Large Standard Estapor® Microspheres

Product	Diameter (µm)	Polymer	Cat. No.
L200	1.800-2.200	Polystyrene	**23 694 081**
L300	2.700-3.300	Polystyrene	**39 480 080**

Estapor® Functionalized Nanospheres and Microspheres

The Estapor® range provides numerous choices for customization as per your preferred chemical and/or biomolecule of interest. Our highly varied portfolio of functionalized products are extremely uniform with excellent lot-to-lot reproducibility (**Figure 5**).

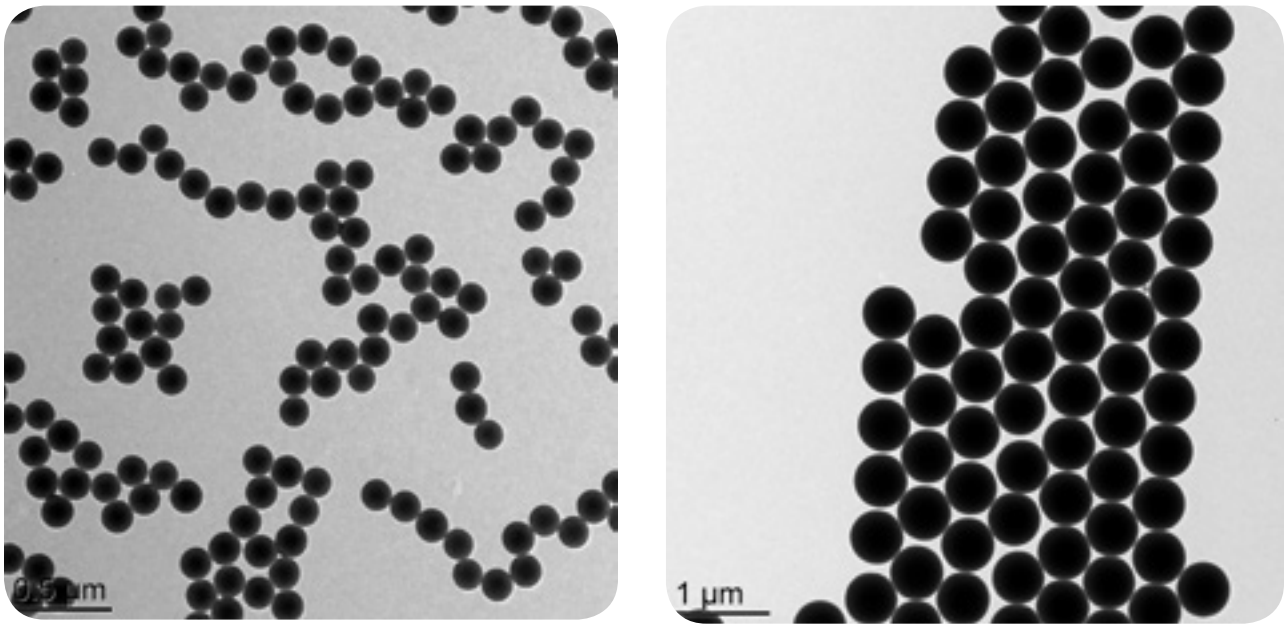

Figure 5. TEM pictures of Estapor® Carboxylated Microspheres, K1-010 (lot M4263, left) and K1-050 (lot M4266, right).

The introduction of highly polar or ionizable chemical groups increases the colloidal stability of the microsphere suspension for **long term storage** of the raw material. Biomolecules, such as polyclonal or monoclonal antibodies, proteins and haptens, allow for targeted binding.

Different functional groups (-COOH, $-NH_2$, -OH, $-CH_2Cl$, $-CONH_2$, $-SO_3H$, $-COOCH_3$) can be produced by various polymerization techniques (functional monomers, initiators…). Due to their tendency to have a more hydrophilic surface, our functionalized polymer microspheres have a very low level of non-specific binding.

The most popular protocols for covalent binding can be carried out with our functionalized microspheres.

We offer a large range of sizes (from about 50nm up to 2µm and more) suitable for most microsphere-based technologies (**Table 1**). Estapor® Microspheres are routinely used worldwide in the following applications:[2,6-10]

- Nephelometric assays
- Enhanced immunoturbidimetric (IT) assays (**Figure 6**)[8-10]
- Latex agglutination tests (LAT)
- Solid phase immunoassays
- Microsphere capture ELISA

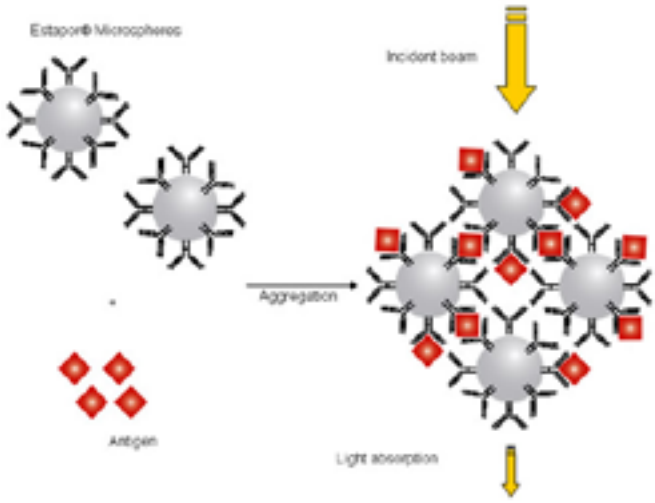

Figure 6. Estapor® Microspheres coated with antibody form insoluble immuno-complexes when mixed with sample containing the corresponding antigen in a latex-enhanced IT immunoassay.

Small, Medium and Large Estapor® Carboxylated Microspheres (-COOH)

Product	Diameter (µm)	Polymer	Cat. No.
Styrene acrylate polymer*			
A1-005	0.050-0.075	Styrene acrylate polymer	**80 380 018**
A1-010	0.076-0.125	Styrene acrylate polymer	**80 380 020**
Styrene copolymer			
K1-005	<0.050	Styrene copolymer	**39 504 001**
K1-010	0.130-0.190	Styrene copolymer	**39 491 087**
K1-020	0.200-0.260	Styrene copolymer	**39 505 001**
KH1-020 (high COOH)	0.150-0.250	Styrene copolymer	**80 380 206**
K1-030	0.270-0.330	Styrene copolymer	**80 380 014**
K1-040	0.340-0.440	Styrene copolymer	**80 380 592**
K1-050	0.450-0.530	Styrene copolymer	**39 424 086**
K1-070	0.640-0.750	Styrene copolymer	**39 386 084**
K1-080	0.760-0.940	Styrene copolymer	**23 696 087**
K1-100	0.950-1.100	Styrene copolymer	**39 498 081**
L1-200	2.000-2.600	Styrene copolymer	**39 510 001**

*Other sizes possible in this range upon request. Styrene acrylate polymer has a different refractive index which is good for optical reading techniques (e.g. nephelometry, enhanced IT).

Other Estapor® Carboxylated Microspheres (-COOH)

Product	Diameter (µm)	Polymer	Cat. No.
PSI 90-21	0.080-0.150	Styrene copolymer	**80 380 012**
PSI 162	0.300-0.350	Styrene copolymer	**80 380 069**
PSI 583	0.750-0.900	Styrene copolymer	**39 585 001**

Other sizes possible in this range upon request. PSI products have a different polymer formulation, which may provide different optical as well as surface properties.

Small, Medium and Large Estapor® Aminated Microspheres (K2-Alkyl-NH_2, K3-Aryl-NH_2)

Product	Diameter (µm)	Polymer	Cat. No.
K2-005	<0.050	Styrene copolymer	**80 380 208**
K2-020	0.150-0.200	Styrene copolymer	**39 507 001**
K2-025	0.210-0.260	Styrene copolymer	**23 698 084**
K2-080	0.800-0.940	Styrene copolymer	**80 380 028**
K3-025	0.210-0.275	Styrene copolymer	**80 380 553**
K3-035	0.326-0.375	Styrene copolymer	**80 380 578**
K3-080	0.800-0.940	Styrene copolymer	**39 423 083**

Larger sizes also possible upon request.

Estapor® Hydroxylated Microspheres (-OH)

Product	Diameter (µm)	Polymer	Cat. No.
K4-005	<0.050	Styrene copolymer	**80 380 209**
K4-030	0.280-0.350	Styrene copolymer	**39 387 087**
K4-080	0.800-0.940	Styrene copolymer	**39 388 081**

Estapor® Sulfonated Micropsheres (-SO_3H)

Product	Diameter (µm)	Polymer	Cat. No.
K5-010	0.076-0.125	Styrene copolymer	**80 380 210**
K5-015	0.126-0.175	Styrene copolymer	**39 389 084**

Estapor® Quaternary Ammonium-Modified Microspheres [-$N^+(CH_3)_3$]

Product	Diameter (µm)	Polymer	Cat. No.
K6-020	0.170-0.230	Styrene copolymer	**39 390 088**
K6-100	0.950-1.100	Styrene copolymer	**80 380 211**

Estapor® Chloromethyl-Modified Microspheres (-CH_2Cl): One-step coupling

Microspheres with functional chloromethyl groups are classified as “pre-activated” and undergo direct, covalent coupling to amine groups on proteins. Since no pre-treatment of the particles is required, the coupling protocol is simpler; yet the conjugates retain the long-term stability associated with conventional two-step covalent conjugation protocols.

Product	Diameter (µm)	Polymer	Cat. No.
K9-007	0.075-0.090	Styrene copolymer	**80 380 162**
KL9-010 (Low CH_2Cl)	0.075-0.124	Styrene copolymer	**80 380 613**
K9-010	0.091-0.175	Styrene copolymer	**80 380 582**
K9-020	0.176-0.260	Styrene copolymer	**39 509 001**
K9-030	0.261-0.350	Styrene copolymer	**80 380 588**
K9-050	0.451-0.530	Styrene copolymer	**80 380 583**
K9-080	0.761-0.900	Styrene copolymer	**39 391 082**
K9-100	0.901-1.200	Styrene copolymer	**80 380 584**

Estapor® Surfactant-Free Microspheres (adsorption)

Product	Diameter (µm)	Polymer	Cat. No.
KSF-007	0.050-0.100	Styrene copolymer	**80 380 030**
KSF-010	0.101-0.140	Styrene copolymer	**80 380 104**
KSF-015	0.141-0.180	Styrene copolymer	**80 380 103**
KSF-020	0.181-0.220	Styrene copolymer	**80 380 033**

Other sizes available upon request. KSF products are of great use when surfactant can hinder good binding of biomolecules.

Estapor® High Density Carboxylated Microspheres (Density: ~1.2 g/cm³)

Product	Diameter (µm)	Polymer	Cat. No.
HD1-010	0.130-0.190	Styrene copolymer	**80 380 002**

Estapor® Low Density Carboxylated Microspheres (Density: ~1.02 g/cm³)

Product	Diameter (µm)	Polymer	Cat. No.
B1-020	0.175-0.225	Styrene-butadiene	**39 384 087**

For information, upon drying, Estapor® styrene-butadiene microspheres coalesce and thus may form a film.

Estapor® White Kits for Evaluation

To enable you to test several types of microspheres of different sizes, surfaces or densities, we offer evaluation kits of 5 different Estapor® White Microspheres.

Kits contain 5 vials of either 5mL, 10mL or 50mL each.

Estapor® Calibration Standards

(in accordance with NIST)

Estapor® Calibration Standard (ECS) Microspheres are used in scientific and industrial laboratories for the calibration and the standardization of particle measurement systems (**Figure 7**).[11,12] They also can be used in quality control programs and development of new analytical methods in numerous fields.

Principle of measurement

ECS Microspheres have been calibrated according to the recommendations of **The National Institute of Standards and Technology (NIST)**. First, the ECS Microsphere sample and Standard Reference Material 1690 or 1691 (NNBS) are mixed together. The preparation is then observed by Transmission Electron Microscopy (TEM) and photos taken.

Initially the average mean microsphere diameter is optically determined via TEM and then the real size is obtained by multiplying this value with the effective magnification rate of the microscope when taking the photo.

Our ECS Microspheres are supplied at 0.5% concentration in water (50mg/10g).

Product	Diameter (µm)	Polymer	Cat. No.
ECS 030	0.276-0.325	Polystyrene	**39 368 082**
ECS 050	0.476-0.575	Polystyrene	**39 369 085**
ECS 080	0.750-0.890	Polystyrene	**39 370 080**

Figure 7. Calibrated Particles, Estapor® Microspheres

For all your assays

A full range of our products are available to accompany your Estapor® Microspheres.

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