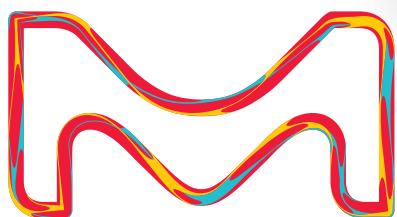
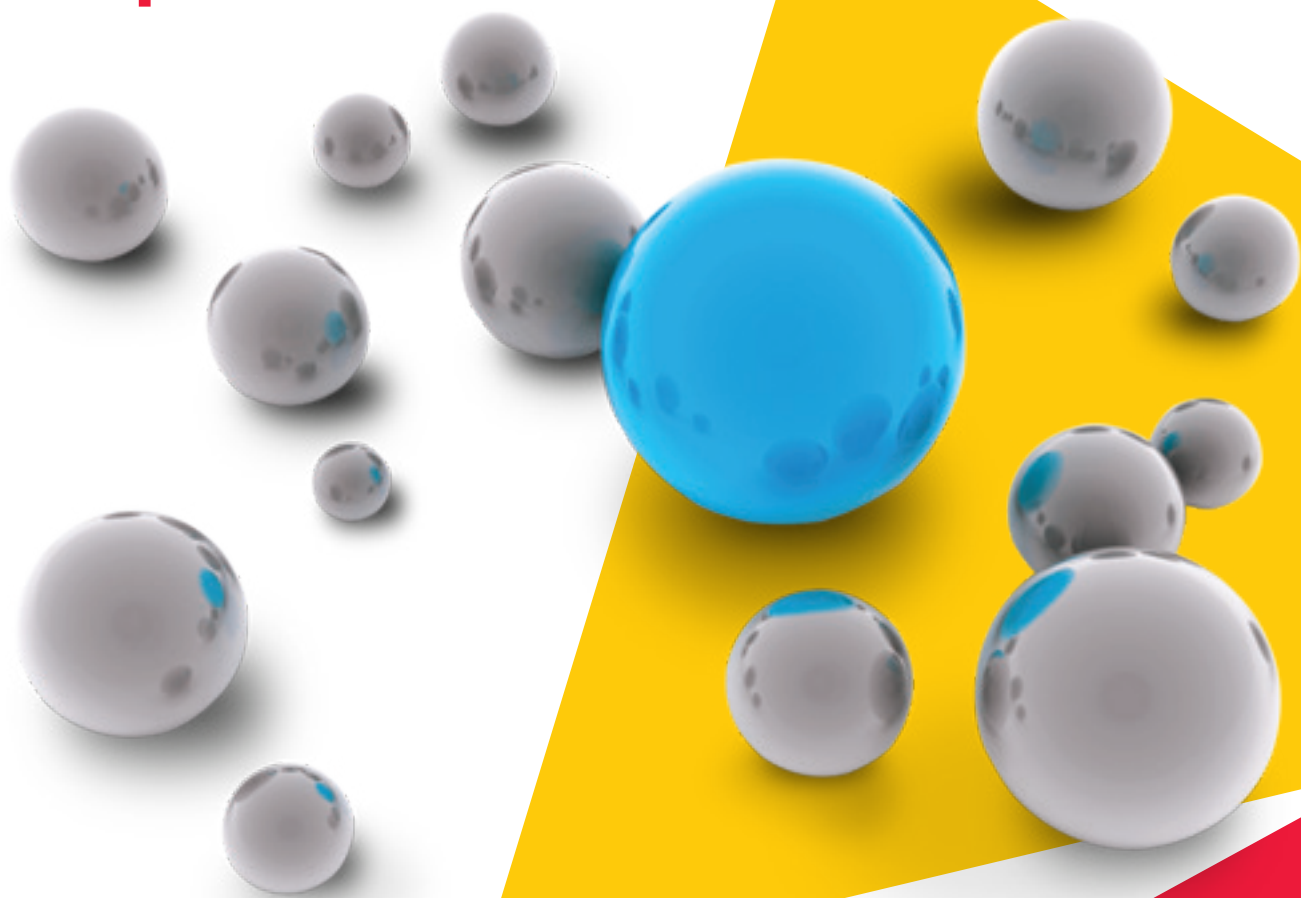


# Estapor<sup>®</sup> White Microspheres



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

**Sigma-Aldrich<sup>®</sup>**  
Lab & Production Materials

# White Microspheres from Merck

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.

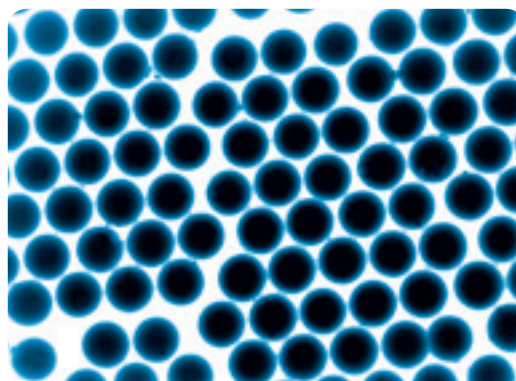
# Estapor® Standard Microspheres and Nanospheres

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:<sup>1,3-5</sup>

- Immunoturbidimetric assays
- Nephelometric assays
- Enhanced immunoturbidimetric assays
- Latex agglutination tests (LAT) (**Figure 4**)<sup>4</sup>
- 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
Immunonephelometry (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

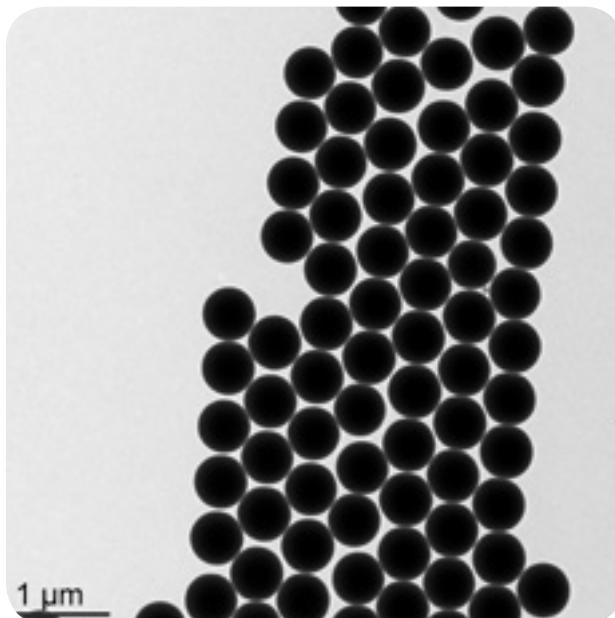
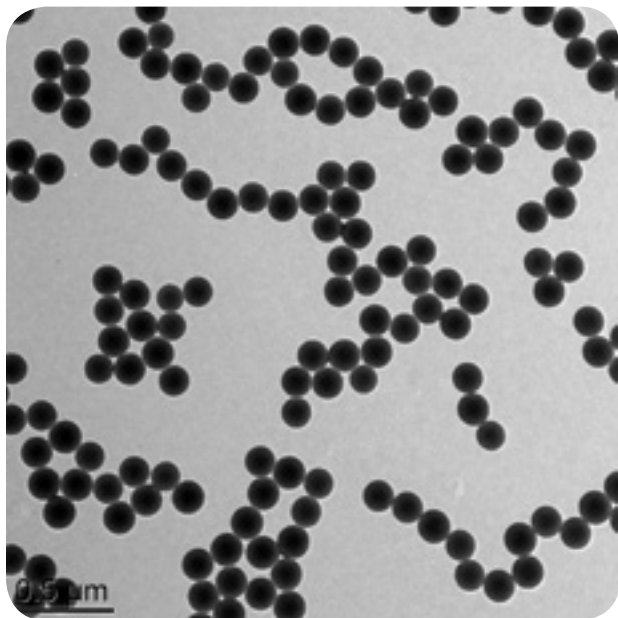
Product	Diameter (µm)	Polymer	Cat. No.
K015	0.126-0.175	Polystyrene	27 712 084
K020	0.176-0.225	Polystyrene	39 430 087
K025	0.226-0.275	Polystyrene	23 689 083
K030	0.276-0.325	Polystyrene	23 690 087
K035	0.326-0.375	Polystyrene	39 380 084
K040	0.376-0.425	Polystyrene	23 691 081
K045	0.426-0.475	Polystyrene	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).

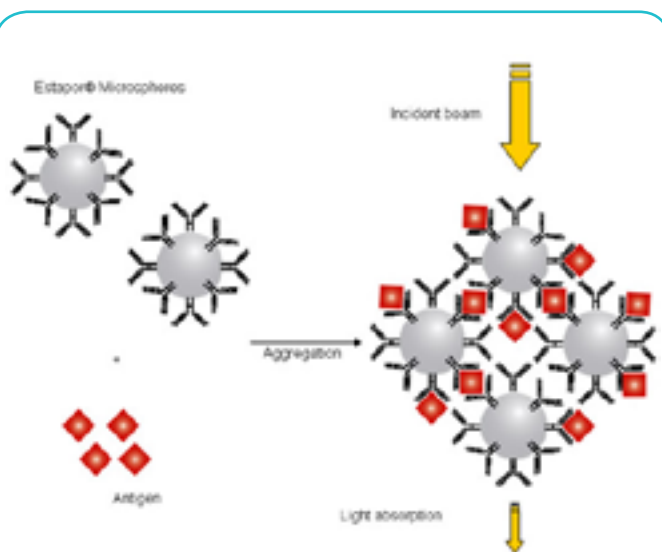
The introduction of highly polar or ionizable chemical groups increases the colloidal stability of the microsphere suspension for **long term storage** of the raw material. Biomolecules, such as polyclonal or monoclonal antibodies, proteins and haptens, allow for targeted binding.

Different functional groups ( $-\text{COOH}$ ,  $-\text{NH}_2$ ,  $-\text{OH}$ ,  $-\text{CH}_2\text{Cl}$ ,  $-\text{CONH}_2$ ,  $-\text{SO}_3\text{H}$ ,  $-\text{COOCH}_3$ ) 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:<sup>2,6-10</sup>

- Nephelometric assays
- Enhanced immunoturbidimetric (IT) assays (**Figure 6**)<sup>8-10</sup>
- 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.
<b>Styrene acrylate polymer*</b>			
A1-005	0.050-0.075	Styrene acrylate polymer	80 380 018
A1-010	0.076-0.125	Styrene acrylate polymer	80 380 020
<b>Styrene copolymer</b>			
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<sub>2</sub>, K3-Aryl-NH<sub>2</sub>)

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<sub>3</sub>H)

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<sup>+</sup>(CH<sub>3</sub>)<sub>3</sub>]

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<sub>2</sub>Cl): 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 <sub>2</sub> Cl)	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/cm<sup>3</sup>)

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/cm<sup>3</sup>)

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**).<sup>11,12</sup> 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).

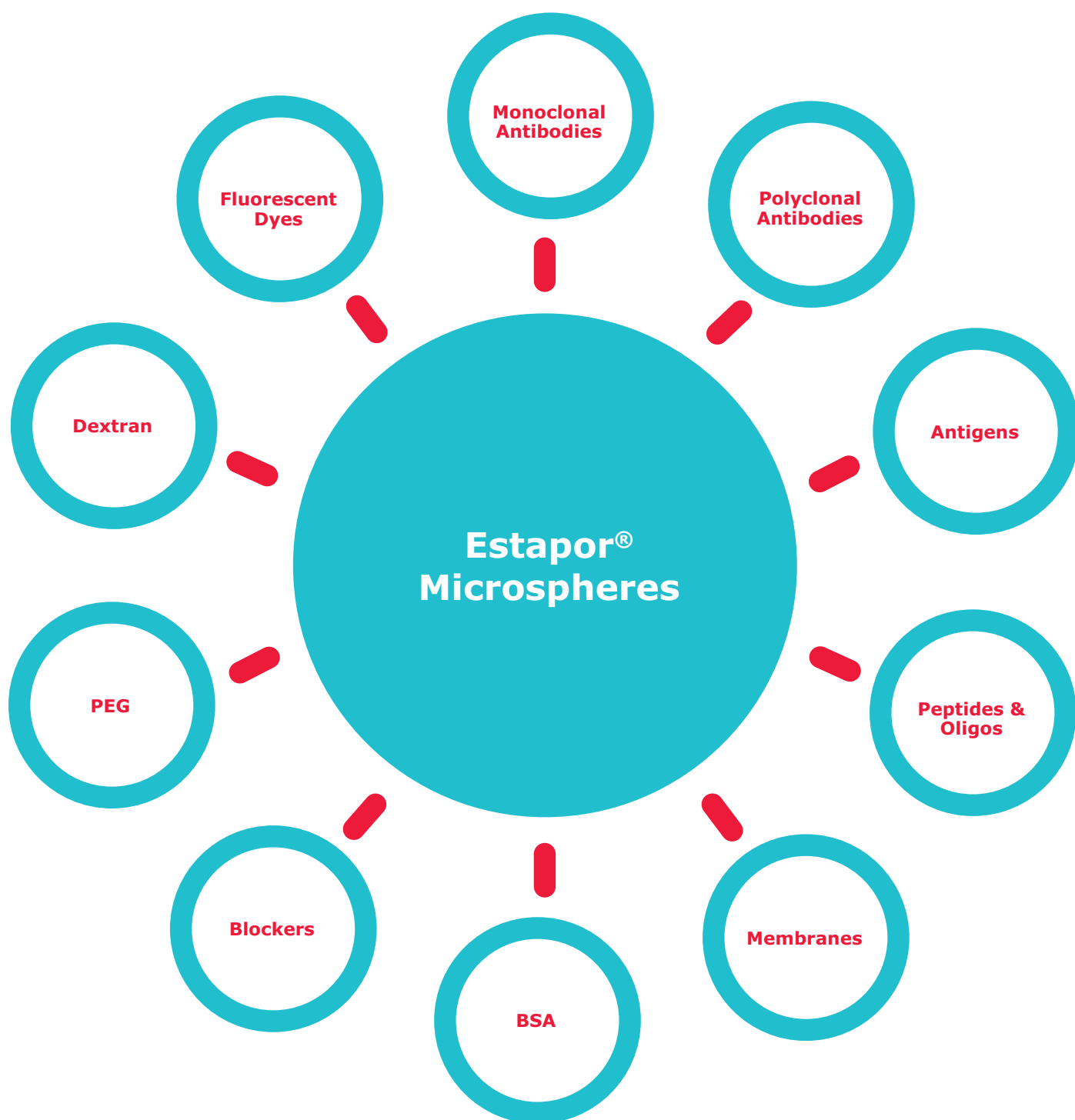
Product	Diameter (µm)	Polymer	Cat. No.
ECS 030	0.276-0.325	Polystyrene	39 368 082
ECS 050	0.476-0.575	Polystyrene	39 369 085
ECS 080	0.750-0.890	Polystyrene	39 370 080



**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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