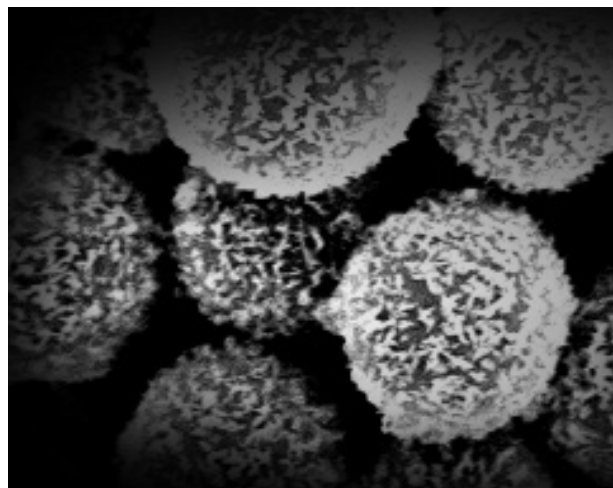


### **SPHERO™ Paramagnetic and Superparamagnetic Particles**

- SPHERO™ Magnetic Microparticles provide high quality and reproducible results for your application
- Allow for rapid and reliable binding between the target and magnetic particle
- Consists of a uniform, monodispersed surface for optimal performance.

The SPHERO™ Magnetic Particles (Paramagnetic Particles) are prepared by coating a layer of iron oxide and polystyrene onto polystyrene core particles. The SPHERO™ Magnetic Particles are relatively uniform in size, spherical in shape and paramagnetic in nature. The paramagnetic nature of the particles allows them to be separated using a magnet and resuspended easily when removed from the magnet. They do not retain any significant magnetism even after repeat exposure to strong magnetic fields. For the maximum uniformity, of shape and size Spherotech offers SPHERO™ Highly Uniform Magnetic Particles in the 1 and 3µm size range.

The SPHERO™ Smooth Surface Magnetic Particles have a thick layer of polymer coating on the surface of the particles to fully encapsulate the iron oxide coating. There is no exposed iron oxide on the surface of the particles. These particles are paramagnetic. The SPHERO™ Smooth Surface Magnetic Particles are particularly useful in applications where exposed iron oxide may interfere with the enzymatic activities or cause other undesirable interferences. The SPHERO™ Magnetic Particles are used for cell separation, affinity purification, DNA probe assays, magnetic particle EIA, etc.

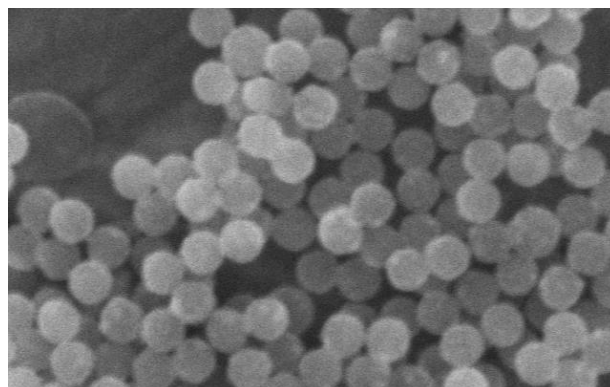


SEM of CM-80-10

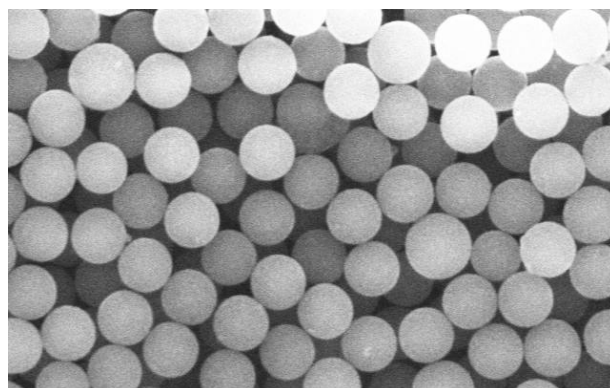
The SPHERO™ High Iron Superparamagnetic and Silica Magnetic Particles have significantly greater magnetite content (~40%). The large surface area combined with higher magnetite content make SPHERO™ High Iron Magnetic Particles ideal solid phase for use in cell separation, magnetic removal of microorganisms, viruses and cross reactants in serum, as well as, affinity purification applications.

SPHERO™ Silica Magnetic Beads are designed to binds RNA and DNA in the presence of chaotropic reagents or under mild acidic buffer conditions. They are positively charged and bind the negatively charged nucleic acids. In addition, they can be used with a variety of organosilane chemistry approaches to modify the surface of magnetic of the silica magnetic bead.

The SPHERO™ Cross-linked Magnetic Particles are prepared to render them resistant to common organic solvents such as acetone, acetonitrile, DMF and chloroform. Uniform diameters between 1 to 100 micron are available.



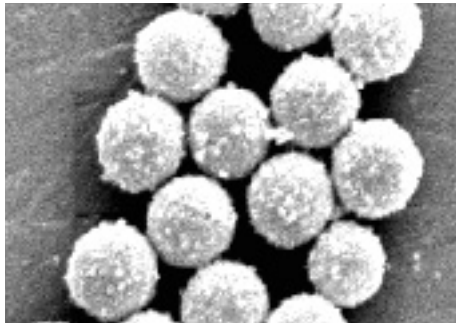
SEM of CMU-10-10 from a JEOL JCM-6000



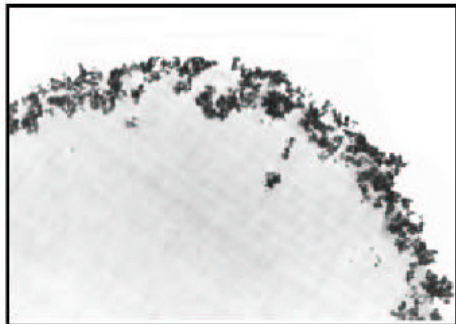
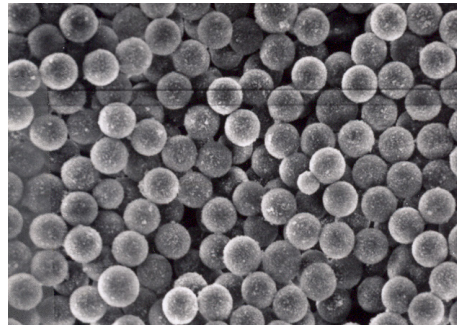
SEM of CMU-30-10 from a JEOL JCM-6000

**SPHERO™ Paramagnetic Magnetic Particles**

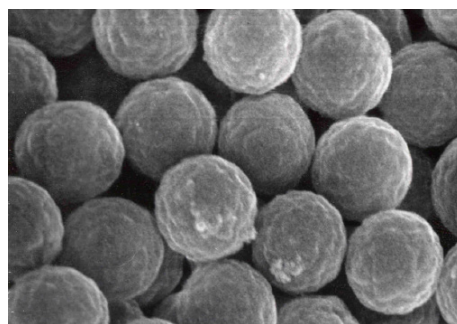
SEM of CM-30-10 at 2000x



SEM of CM-40-10 at 1000X



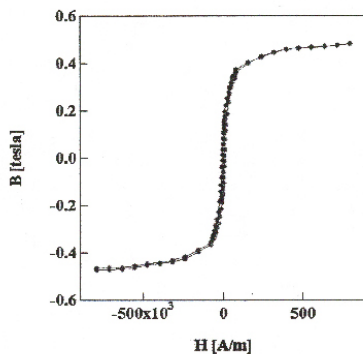
Cross section of SPHERO™ Magnetic Particles showing magnetite layer on the surface of core particles



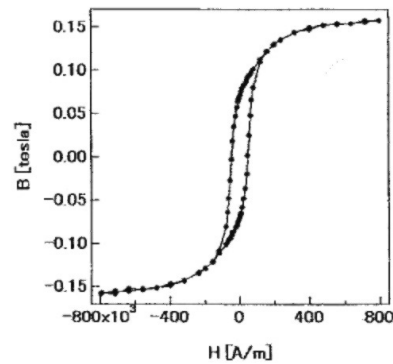
SEM of CMS-40-10 at 5000x

**Magnetic Characteristics of SPHERO™ Magnetic Particles and Ferromagnetic Particles**

The magnetic characteristics of magnetic particles are determined by measuring the magnetic Hysteresis Loop of magnetic particles with a magnetometer as shown below. The magnetic particles are subjected to an increasing magnetizing field (H in Oersteds) in one direction, while sensing the magnetic field (B in Gauss) in the sample to reach maximum or saturation magnetization (Bm). The magnetizing field is then returned to zero and the field retained is measured as the remnant magnetization (Br). Finally, the field is reversed until magnetization is at zero again. The corresponding field strength (Hc) is the coercivity of the magnetic particles. If the Br and Hc are near zero, the magnetic particles are characterized as superparamagnetic as shown for Cat. No. CM-10-10. On the other hand, the Ferromagnetic Particles will have Hysteresis Loop similar to Cat. No. CFM-40-10.



CM-10-10 showing paramagnetic characteristics



CFM-40-10 showing ferromagnetic characteristics

**SPHERO™ Magnetic Polystyrene Particles**

- Consists of paramagnetic particles prepared by coating a layer of iron oxide and polystyrene onto polystyrene core particles
- Uniform in size and spherical in shape
- Separated using a magnet and resuspended when removed from the magnetic field
- Used for cell separation, affinity purification, DNA probe assays, magnetic particle EIA, etc.

| Particle Type and Surface | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|---------------------------|---------------------|-------|-------------|-------|
| Magnetic Polystyrene      | 2.0-2.9             | 2.5   | PM-20-10    | 10 mL |
| Magnetic Polystyrene      | 3.0-3.9             | 2.5   | PM-30-10    | 10 mL |
| Magnetic Polystyrene      | 4.0-4.5             | 2.5   | PM-40-10    | 10 mL |
| Magnetic Polystyrene      | 5.0-5.9             | 2.5   | PM-50-10    | 10 mL |

**SPHERO™ Carboxyl Magnetic Particles**

- Used during the isolation and affinity purification of biomolecules in a wide range of assays and applications
- Contains carboxylic acid groups which can be used for carbodiimide activation (e.g. EDC) for covalent coupling
- Couples to the primary amino groups of nucleic acids, peptides, proteins or other target molecules.

| Particle Type and Surface | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit   |
|---------------------------|---------------------|-------|-------------|--------|
| Carboxyl Magnetic         | 0.1-0.39            | 2.5   | CM-025-10   | 10 mL  |
| Carboxyl Magnetic         | 0.4-0.69            | 2.5   | CM-05-10    | 10 mL  |
| Carboxyl Magnetic         | 0.7-0.9             | 2.5   | CM-08-10    | 10 mL  |
| Carboxyl Magnetic         | 1.0-1.4             | 2.5   | CM-10-10    | 10 mL  |
| Carboxyl Magnetic         | 1.0-1.4             | 2.5   | CM-10-100   | 100 mL |
| Carboxyl Magnetic         | 1.5-1.9             | 2.5   | CM-15-10    | 10 mL  |
| Carboxyl Magnetic         | 1.5-1.9             | 2.5   | CM-15-100   | 100 mL |
| Carboxyl Magnetic         | 2.0-2.9             | 2.5   | CM-20-10    | 10 mL  |
| Carboxyl Magnetic         | 2.0-2.9             | 2.5   | CM-20-100   | 100 mL |
| Carboxyl Magnetic         | 3.0-3.9             | 2.5   | CM-30-10    | 10 mL  |
| Carboxyl Magnetic         | 3.0-3.9             | 2.5   | CM-30-50    | 50 mL  |
| Carboxyl Magnetic         | 3.0-3.9             | 2.5   | CM-30-100   | 100 mL |
| Carboxyl Magnetic         | 4.0-4.5             | 2.5   | CM-40-10    | 10 mL  |
| Carboxyl Magnetic         | 4.0-4.5             | 2.5   | CM-40-100   | 100 mL |
| Carboxyl Magnetic         | 5.0-5.9             | 2.5   | CM-50-10    | 10 mL  |
| Carboxyl Magnetic         | 6.0-8.0             | 2.5   | CM-60-10    | 10 mL  |
| Carboxyl Magnetic         | 6.0-8.0             | 2.5   | CM-60-100   | 100 mL |
| Carboxyl Magnetic         | 8.0-9.9             | 2.5   | CM-80-10    | 10 mL  |
| Carboxyl Magnetic         | 10.0-13.9           | 1.0   | CM-100-10   | 10 mL  |
| Carboxyl Magnetic         | 14.0-17.9           | 1.0   | CM-150-10   | 10 mL  |
| Carboxyl Magnetic         | 18.0-22.9           | 1.0   | CM-200-10   | 10 mL  |
| Carboxyl Magnetic         | 27.0-37.0           | 1.0   | CM-300-10   | 10 mL  |

**SPHERO™ Jeffamine® Magnetic Particles**

Contains a PEG-based spacer arm that is terminated with amine groups for coupling carboxyl-containing molecules.

| Particle Type and Surface           | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|-------------------------------------|---------------------|-------|-------------|-------|
| Jeffamine® Magnetic                 | 0.1-0.39            | 1.0   | JAM-025-10  | 10 mL |
| Jeffamine® Magnetic                 | 3.0-3.9             | 2.5   | JAM-30-10   | 10 mL |
| Jeffamine® Magnetic, Smooth Surface | 3.0-3.9             | 2.5   | JAMS-30-10  | 10 mL |

JEFFAMINE® is a registered trademark of Huntsman Corporation

**SPHERO™ Carboxyl PMMA Magnetic Particles**

Provides carboxyl magnetic beads with less autofluorescence than magnetic polystyrene beads

| Particle Type and Surface | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|---------------------------|---------------------|-------|-------------|-------|
| Carboxyl PMMA Magnetic    | 3.0-3.9             | 1.0   | CPMA-30-10  | 10 mL |

**SPHERO™ Highly Uniform Magnetic Particles**

| Particle Type and Surface | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|---------------------------|---------------------|-------|-------------|-------|
| Carboxyl Magnetic         | 1.0-1.4             | 2.5   | CMU-10-10   | 10 mL |
| Carboxyl Magnetic         | 3.0-3.9             | 2.5   | CMU-30-10   | 10 mL |

**SPHERO™ Epoxy Magnetic Particles**

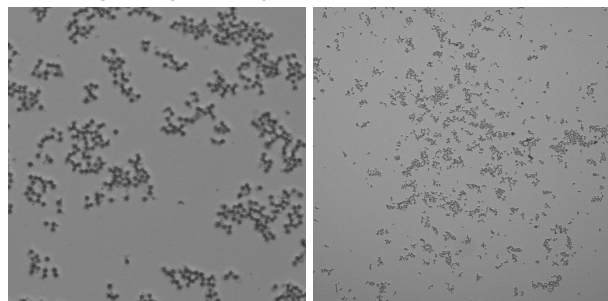
Covalently binds to primary amino and sulfhydryl groups in proteins and peptides

| Particle Type and Surface      | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit   |
|--------------------------------|---------------------|-------|-------------|--------|
| Epoxy Magnetic                 | 0.4-0.6             | 2.5   | EM-05-10    | 10 mL  |
| Epoxy Magnetic                 | 2.0-2.9             | 2.5   | EM-20-10    | 10 mL  |
| Epoxy Magnetic                 | 2.0-2.9             | 2.5   | EM-20-100   | 100 mL |
| Epoxy Magnetic, Smooth Surface | 3.0-3.9             | 2.5   | EM-30-10    | 10 mL  |



### SPHERO™ Amino Magnetic Particles

- Supplied as an aqueous suspension magnetic particles to provide primary amino groups
- Used to covalently couple proteins using bifunctional crosslinking agents
- Rapidly separates bound from unbound molecules using a magnetic separator.

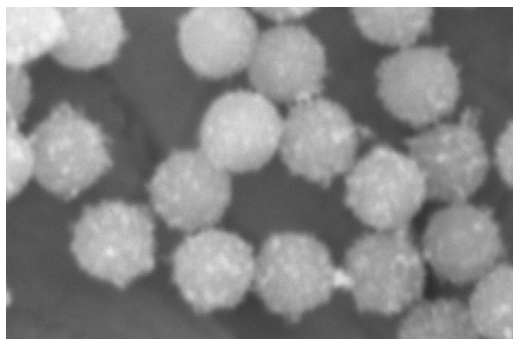


Differential interference contrast images of AM-10-10

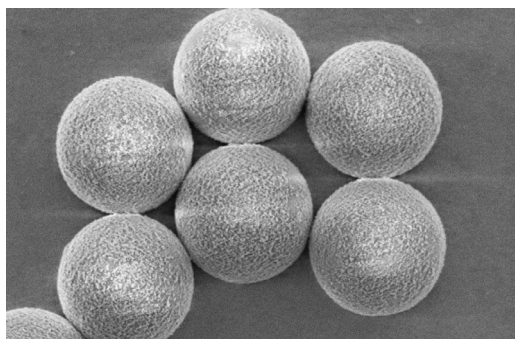
| Particle Type and Surface | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit   |
|---------------------------|---------------------|-------|-------------|--------|
| Amino Magnetic            | 1.0-1.4             | 2.5   | AM-10-10    | 10 mL  |
| Amino Magnetic            | 1.0-1.4             | 2.5   | AM-10-100   | 100 mL |
| Amino Magnetic            | 1.5-1.9             | 2.5   | AM-15-10    | 10 mL  |
| Amino Magnetic            | 1.5-1.9             | 2.5   | AM-15-100   | 100 mL |
| Amino Magnetic            | 2.0-2.9             | 2.5   | AM-20-10    | 10 mL  |
| Amino Magnetic            | 2.0-2.9             | 2.5   | AM-20-100   | 100 mL |
| Amino Magnetic            | 3.0-3.9             | 2.5   | AM-30-10    | 10 mL  |
| Amino Magnetic            | 3.0-3.9             | 2.5   | AM-30-100   | 100 mL |
| Amino Magnetic            | 4.0-4.9             | 2.5   | AM-40-10    | 10 mL  |
| Amino Magnetic            | 4.0-4.9             | 2.5   | AM-40-100   | 100 mL |
| Amino Magnetic            | 6.0-6.9             | 1.0   | AM-60-10    | 10 mL  |
| Amino Magnetic            | 6.0-6.9             | 1.0   | AM-60-100   | 100 mL |
| Amino Magnetic            | 8.0-9.9             | 1.0   | AM-80-10    | 10 mL  |

### SPHERO™ Magnetic Cross-linked Particles

- Resistant to common organic solvents such as acetone, acetonitrile, DMF and chloroform
- Used in a wide variety of molecular biology, nucleic acid isolation, research protocols and clinical immunoassay reagent applications.



SEM of CMX-10-10



SEM of CMX-300-10

| Particle Type and Surface                           | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit   |
|---|---------------------|-------|-------------|--------|
| Magnetic, Cross-linked, granules, non-uniform       | 3.0-6.0             | 2.5   | PMX-40-10   | 10 mL  |
| Amino Magnetic, Cross-linked                        | 1.0-2.0             | 2.5   | AMX-10-10   | 10 mL  |
| Amino Magnetic, Cross-linked                        | 1.0-2.0             | 2.5   | AMX-10-100  | 100 mL |
| Amino Magnetic, Cross-linked                        | 3.0-3.9             | 2.5   | AMX-30-10   | 10 mL  |
| Amino Magnetic, Cross-linked, granules, non-uniform | 3.0-6.0             | 2.5   | AMX-40-10   | 10 mL  |
| Amino Magnetic, Cross-linked                        | 13.0-17.99          | 1.0   | AMX-150-5   | 5 mL   |
| Carboxyl Magnetic, Cross-linked                     | 1.0-2.0             | 2.5   | CMX-10-10   | 10 mL  |
| Carboxyl Magnetic, Cross-linked                     | 1.0-2.0             | 2.5   | CMX-10-100  | 100 mL |
| Carboxyl Magnetic, Cross-linked                     | 3.0-6.0             | 2.5   | CMX-40-10   | 10 mL  |
| Carboxyl Magnetic, Cross-linked                     | 18-22.9             | 1.0   | CMX-200-10  | 10 mL  |
| Carboxyl Magnetic, Cross-linked                     | 25-37               | 1.0   | CMX-300-10  | 10 mL  |
| Carboxyl Magnetic, Cross-linked                     | 25-37               | 1.0   | CMX-300-100 | 100 mL |
| Carboxyl Magnetic, Cross-linked                     | 90-120              | 1.0   | CMX-1000-10 | 10 mL  |

### SPHERO™ Aldehyde Magnetic Particles

Large magnetic beads used for the covalently conjugation of primary amine-containing ligands.

| Particle Type and Surface | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|---------------------------|---------------------|-------|-------------|-------|
| GLM-300-10                | 25-37               | 1.0   | GLM-300-10  | 10 mL |

**SPHERO™ Magnetic Polystyrene Particles, Smooth Surface**

- Consists of a thick layer of polymer coating on the surface to encapsulate the iron oxide coating
- No exposed iron oxide on the surface
- Used in applications where exposed iron oxide causes undesirable interferences.

| Particle Type and Surface                | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|--|---------------------|-------|-------------|-------|
| Magnetic Polystyrene ,<br>Smooth Surface | 2.0-2.9             | 2.5   | PMS-20-10   | 10 mL |
| Magnetic Polystyrene ,<br>Smooth Surface | 3.0-3.9             | 2.5   | PMS-30-10   | 10 mL |
| Magnetic Polystyrene ,<br>Smooth Surface | 4.0-5.0             | 2.5   | PMS-40-10   | 10 mL |

**SPHERO™ Amino Magnetic Particles, Smooth Surface**

- Aids in the separation in whole blood
- Monodispersed surface for optimal performance.

| Particle Type and Surface                    | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|--|---------------------|-------|-------------|-------|
| Amino Magnetic, Smooth<br>Surface            | 4.0-5.0             | 2.5   | AMS-40-10   | 10 mL |
| Amino Magnetic, Smooth<br>Surface, High Iron | 4.0-5.0             | 2.5   | AMS-40-10H  | 10 mL |

**SPHERO™ Carboxyl Magnetic Particles, Smooth Surface**

- Activated for covalent coupling to amine-containing molecules using a variety of mechanisms
- Used with one or two-step coupling using EDC to form amide bonds with proteins or other molecules
- Used for coupling to amino modified oligonucleotide probes with MES buffer and EDC.

*\*See page 82 for a Differential interference contrast images of CMS-40-10*

| Particle Type and Surface            | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit   |
|--------------------------------------|---------------------|-------|-------------|--------|
| Carboxyl Magnetic,<br>Smooth Surface | 3.0-3.9             | 2.5   | CMS-30-10   | 10 mL  |
| Carboxyl Magnetic,<br>Smooth Surface | 3.0-3.9             | 2.5   | CMS-30-100  | 100 mL |
| Carboxyl Magnetic,<br>Smooth Surface | 4.0-5.0             | 2.5   | CMS-40-10   | 10 mL  |
| Carboxyl Magnetic,<br>Smooth Surface | 4.0-5.0             | 2.5   | CMS-40-100  | 100 mL |
| Carboxyl Magnetic,<br>Smooth Surface | 8.0-9.9             | 1.0   | CMS-80-10   | 10 mL  |
| Carboxyl Magnetic,<br>Smooth Surface | 18.0-22.9           | 1.0   | CMS-200-10  | 10 mL  |

**SPHERO™ Hydroxyethyl Magnetic Particles, Smooth Surface**

- Contains primary hydroxyls on the surface
- Activated for covalent coupling using epoxy and vinyl sulfone activation procedures
- Used for the coupling to amine-, thiol-, or hydroxyl-containing ligands.

| Particle Type and Surface                | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|--|---------------------|-------|-------------|-------|
| Hydroxyethyl Magnetic,<br>Smooth Surface | 3.0-3.9             | 2.5   | HEMS-30-10  | 10 mL |

**SPHERO™ Diethylamino Magnetic Particles**

| Particle Type and Surface | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|---------------------------|---------------------|-------|-------------|-------|
| Diethylamino Magnetic     | 3.0-3.9             | 2.5   | DEM-30-10   | 10 mL |

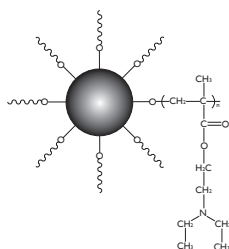


Illustration of a DEAE magnetic particle.

**SPHERO™ Dimethylamino Magnetic Particles**

| Particle Type and Surface | Size, $\mu\text{m}$ | % w/v | Catalog No. | Unit  |
|---------------------------|---------------------|-------|-------------|-------|
| Dimethylamino Magnetic    | 3.0-3.9             | 2.5   | DM-30-10    | 10 mL |

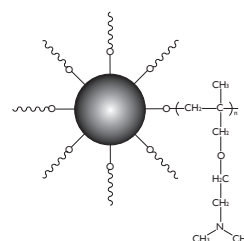


Illustration of a DMAE magnetic particle.