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General handling and storage of water soluble iron oxide magnetic nanoparticles

This applies to the following iron oxide (IO) magnetic nanoparticles with product catalog numbers:

SHP-carboxyl groups on the surface
SVP-AclaF™ IO with carboxyl groups
SYP-LyoF™ IO with carboxyl groups
SXP-endotoxin free IO with carboxyl groups
SHA- amine groups on the surface with PEG coating
SMG- PEG coating with no reactive groups on the surface
SEI-polyethylenimine coating
SHQ-PDDA coating
IAB-antibody conjugated
IAG-antigen conjugated
SHE-enzyme conjugated
IPG-protein G conjugated
SHS-streptavidin conjugated
IRB-Rhodamine B conjugated with PEG coating
IFA-folic acid conjugated
ILP-lipid coated with no reactive groups
ILA-lipid coated with amine groups
ILT-lipid coated with NTA-Ni
IDX-dextran coated

1. Storage

SHP can be stored at 4-25°C for at least 6 months without precipitation. SEI can be stored at 4°C for 12 months. Other iron oxide nanoparticles should be stored at 4°C for 3 months. The storage time for nanoparticle-protein conjugates is dependent on the lifetime of the proteins. Always iron oxide magnetic nanoparticles should be stored in a plastic container.

***Do not freeze nanoparticles without any cryoprotectant.

2. Autoclaving

For delicate experiments which require septic or DNase free conditions, iron oxide magnetic nanoparticles, including SHP, SHA, SMG, SEI, SHQ, ILP, ILA, IDX can be autoclaved at 121°C for 30 min, the common procedure to kill DNase/RNase and microorganisms.

3. Determination of iron concentration



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The iron concentration of iron oxide nanoparticles can be determined spectrophotometrically using the equation below:

Fe concentration (mg/mL) = (OD_{500nm} - OD_{800nm}) × dilution factor / extinction coefficients*

*5 for 15 nm or bigger iron oxide nanoparticles; 4.3 for 10 and 5 nm nanoparticles; 3.25 for IDX.

For the most accurate measurements, optical density at 500 nm should be around 0.5.

5 mg/mL Fe (for SHP, IDX) and 1 mg/mL Fe (for other iron oxide nanoparticles) are recommended for storage concentration. Higher Fe concentration (up to 10 mg/mL Fe) can be reached but not recommended for long term storage.

Note: use the following formula for IRB10

Fe concentration (mg/ml) = 0.55 × (OD_{450nm} - OD_{800nm}) × dilution factor / 4.3

4. Determination of particle amount

Once the Fe concentration is determined, check the following chart for particle amount:

Particle Size (nm)	Nanoparticle Amount (nmol) of 1 mg Fe	Nanoparticle Amount (nmol) of 10 mg Fe	Nanoparticle Amount (nmol) of 50 mg Fe
5	6.9	69	345
10	0.86	8.6	43.0
15	0.27	2.7	13.5
20	0.11	1.1	5.5
25	0.058	0.58	2.9
30	0.034	0.34	1.7
35	0.021	0.21	1.05
40	0.014	0.14	0.7
45	0.010	0.1	0.5
50	0.0073	0.073	0.365



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5. Colloidal stability in aqueous buffers and cell medium

Please check the specification sheet of the individual product for colloidal stability in different aqueous buffers and cell medium.

6. Stability in organic solvents

SHPs are stable in dimethylsulfoxide (DMSO) and dimethyl formamide (DMF).

7. Gel electrophoresis

Gel electrophoresis is a convenient way to check the uniformity, size, and charge of nanoparticles. It can also be used to monitor the conjugation process by comparing the conjugates with the original unconjugated nanoparticles. Conjugation causes changes in size and surface charge causing changes in electrophoretic mobility. For detailed protocol of gel electrophoresis, please check our website:

<http://oceannanotech.com/upload/090604132955928413aza6sm.pdf>

8. Nanoparticle purification

Water soluble IO nanoparticles can be purified by magnetic separation, ultrafiltration (MWCO \leq 300 K for 15 nm IO and above; MWCO \leq 100K for 5 nm IO and above), dialysis (MWCO \leq 300 K for 15 nm IO and above; MWCO \leq 100K for 5 nm IO and above), ultracentrifugation.

9. Conjugation of biomolecules with –NH₂ to SHP

The standard EDC/NHS coupling method is used to conjugate SHP with the amine groups on the biomolecules of interest. For detailed protocol, please check our website:

<http://oceannanotech.com/upload/110926104418178159681nkg.pdf>

YES! We do provide the conjugation service. For detailed information, please check our website: <http://oceannanotech.com/nav.php?qid=37>

For sample application of nanoparticles, please visit our technical notes at: <http://oceannanotech.com/nav.php?qid=49>

If you have more questions, please contact us at info@oceannanotech.com.