PrecisionMRX® Superparamagnetic Iron Oxide Nanoparticles

Made for the Demands of Biomedical Applications

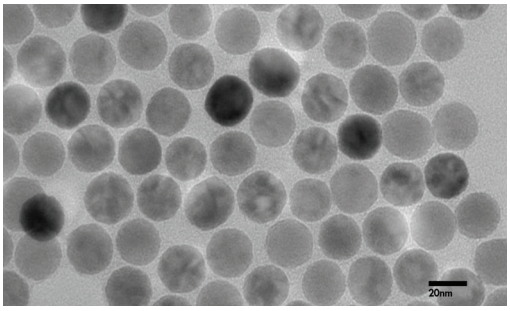
Precise, Uniform, Consistent

PrecisionMRX® nanoparticles are superparamagnetic iron oxide nanoparticles with uniform spherical morphology, narrow size dispersity, and high magnetic relaxivity. To achieve the highest quality, Imagion Biosystems uses the thermal decomposition process, which allows precise control over size, shape, and magnetic properties of the nanoparticles. The manufacturing process is robust and produces high quality magnetite (Fe_3O_4) core nanoparticles with minimal batch-to-batch variability.

PrecisionMRX NANOPARTICLES

PrecisionMRX nanoparticles are made specifically for the demands of biomedical applications and are available with a variety of coatings to facilitate their uses.

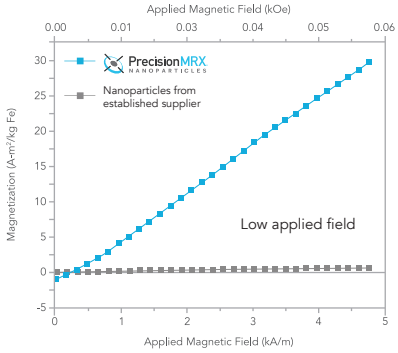
- **Oleic Acid** – Fe_3O_4 core nanoparticles shipped in dried form ready for resuspension in an organic solvent
- **Carboxylic Acid** – Fe_3O_4 core nanoparticles with a polymer coating that provides a carboxylate surface for bio-functionalization
- **mPEG** – Carboxylated iron oxide cores coated with methoxypolyethylene glycol (mPEG) to improve circulation times and reduce opsonization



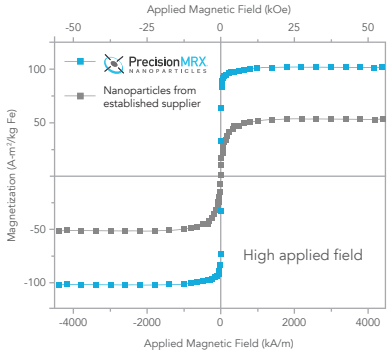
PrecisionMRX® nanoparticles are extensively characterized by small angle X-ray scattering (SAXS) and transmission electron microscopy (TEM) to ensure the magnetite cores have uniformly spherical morphology and are consistent in size with narrow dispersity.

High Magnetic Susceptibility

PrecisionMRX nanoparticles have been developed with high magnetic saturation that is colloidally stable, and therefore useful in biomedical applications.



At low fields, PrecisionMRX nanoparticle magnetization greatly surpasses conventional nanoparticles.



Saturation magnetization of PrecisionMRX nanoparticles is higher than conventional nanoparticles.

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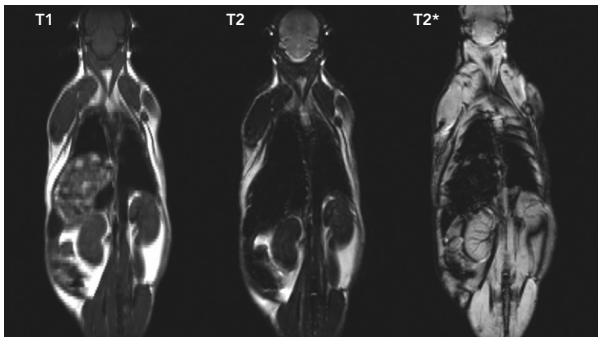
Key Applications

Superparamagnetic Relaxometry

Superparamagnetic relaxometry (SPMR) is a highly sensitive detection technology that is able to differentiate the magnetic signatures of bound from unbound particles in different time scales. When bound to biological tissue, superparamagnetic iron oxide nanoparticles produce a magnetic signal as they relax following electron orbit re-orientation induced by a brief magnetizing pulse. The decaying magnetic signal can be detected and quantified by an array of ultrasensitive magnetic sensors yielding source location and strength. To learn more about SPMR, visit www.imagionbiosystems.com.

Magnetic Resonance Imaging

Superparamagnetic iron oxide nanoparticles enhance T2 relaxation and the observed T2* signal in MRI. Iron oxide is a natural element in the body and can be used as a contrast agent instead of gadolinium. Iron oxide nanoparticles enhance lymph node, bone marrow, and perfusion imaging. The use of iron oxide nanoparticles for MRI has been demonstrated in ultra-low magnetic fields, defined as less than 10 mT[1]. The high magnetization of PrecisionMRX nanoparticles at ultra-low magnetic fields makes possible relaxivity- and susceptibility-based effects that cannot be achieved with conventional contrast agents.



By using different MRI sequences, clear information on anatomy (T1-weighted), nanoparticle location (T2-weighted) and magnetic susceptibility (T2*) can be achieved. MRI images courtesy of University of Sydney.

Magnetic Particle Imaging

Magnetic particle imaging (MPI) is a tracer modality with zero attenuation in tissue, high contrast and sensitivity, and an excellent safety profile. MPI captures the response of superparamagnetic iron oxide nanoparticles as they relax within a transient field-free point produced between oscillating magnetic fields.[2]

Magnetically Induced Hyperthermia

Superparamagnetic iron oxide nanoparticles produce heat when exposed to an alternating magnetic field. Antibody conjugation enables targeted accumulation of nanoparticles at specific tissue sites for localized induction and application of heat by magnetically induced hyperthermia[3].

PrecisionMRX nanoparticles (25nm) coated with carboxylic acid, oleic acid, or methoxypolyethylene glycol are currently available.

Other Applications

- Vaccine Adjuvant[4]
- Drug Delivery
- Theranostic Application
- Magnetomotive Ultrasound Imaging
- Magnetic Cell Enrichment Assays
- Magnetic Immunoassays

PrecisionMRX iron oxide nanoparticles are manufactured by Imagion Biosystems, Inc., a developer of non-invasive, non-radioactive diagnostic imaging technology. Combining nanotechnology and biotechnology, the company aims to use PrecisionMRX nanoparticles to support clinical research and other biomedical applications.

Contact us for bulk quantities or custom orders.

For more information call (855) 564-5264 or visit www.imagionbiosystems.com

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[1] Waddington DEJ, et al., Sci Adv. 2020 Jul 17;6(29)
[2] Tay ZW, et al., Biomed Phys Eng Express. 2017 Jun;3(3):035003
[3] Dennis CL et al., Int J. Hyperth. 20 (2013) 715-729
[4] Ringe RP, et al., J Virol. 2020 Feb 28;94(6):e01883-19