

What Life Scientists Should Know About Molecular Imaging

MR Fundamentals for Life Scientists

Chemical Design of Magnetic Nanoparticles for MR Imaging Agent

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Learning Objectives:

- Nanoscaling laws of magnetic nanoparticles
- Magnetism-engineered nanoparticles
- MRI imaging agent

The unique properties of magnetic nanoparticles arising from superparamagnetism provide them with high potential as the key materials for magnetic resonance imaging (MRI) contrast agents. In this talk, I will discuss the chemical design concept that can lead to development of high performance magnetic nanoparticles as contrast agents for MRI. The design principles allow for the engineering of magnetic properties and surface chemistry of nanoparticles to have capabilities such as high sensitivity and functional groups for molecular imaging. The versatile applications of magnetic nanoparticles as single- or multi-modal contrast agents for enhancing imaging accuracy will be also discussed.

Relevant Publications:

1. Jun, Y.; Cheon, J. *et al.* "Nanoscale Size Effect of Nanocrystals and Their Utilization for Cancer Diagnosis via Magnetic Resonance Imaging (MRI)" *J. Am. Chem. Soc.* 2005, *127*, 5732.
2. Huh, Y.; Cheon, J. *et al.* "In Vivo Magnetic Resonance Detection of Cancer by Using Multifunctional Magnetic Nanocrystals" *J. Am. Chem. Soc.* 2005, *127*, 12387.
3. Cheon, J. *et al.* "Synergistically Integrated Nanoparticles as Multimodal Probes for Nanobiotechnology" *Acc. Chem. Res.* 2008, *41*, 1630.
4. Jun, Y.; Cheon, J. *et al.* "Chemical Design of Nanoparticle Probes for High-Performance Magnetic Resonance Imaging" *Angew. Chemie. Int. Ed.* 2008, *47*, 5122.
5. Lee, J.; Cheon, J. *et al.* "Artificially Engineered Magnetic Nanocrystals for Ultra-Sensitive Molecular Imaging" *Nature Medicine.* 2007, *13*, 95.
6. Choi, J.-s.; Cheon, J. *et al.* "Self-Confirming "AND" Logic Nanoparticles for Fault-Free MRI" *J. Am. Chem. Soc.* 2010, *132*, 11015.
7. Yoo, D.; Cheon, J. *et al.* "Theranostic Magnetic Nanoparticles" *Acc. Chem. Res.* 2011, *44*, 863.
8. Shin, T.-H.; Cheon, J. *et al.* "T1 and T2 Dual-Mode MRI Contrast Agent for Enhancing Accuracy by Engineered Nanomaterials" *ACS Nano* 2014, *ASAP*