

## A simple process for magnetic iron oxide ( $\text{Fe}_3\text{O}_4$ ) nanoparticles in an aqueous solution

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One of the most popular functional magnetic materials with various applications including multi-tera bit storage device, catalysis, sensors, and a platform for high-sensitivity biomolecular magnetic resonance imaging (MRI) for medical diagnosis. We synthesized magnetic iron oxide nanoparticles by a simple process using the octylamine or PEI (polyethyleneimine) as the reactant and surface-functionalizing agent in an aqueous solution. Our synthetic process was performed at the relatively low temperature of 80 degrees centigrade for a short reaction time of 3h. In this synthesis, we found that amine molecules play critical roles for the both formation and stabilization of iron oxide nanoparticles in an aqueous-phase. The synthesized iron oxide nanoparticles were then characterized by using TEM, XRD, XPS, FTIR, and superconducting quantum interference device (SQUID) magnetometer. Spherical Iron oxide nanoparticles have uniform size and narrow size distribution. In addition, XRD measurement indicates that the crystal structure of nanoparticles is magnetite ( $\text{Fe}_3\text{O}_4$ ). We believe that these biocompatible  $\text{Fe}_3\text{O}_4$  nano-colloids will have beautiful various applications including biomedical imaging, diagnostics, and therapeutics.