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Comparison of Monocrystalline Nanocubes and Polycrystalline Nanospheres of Fe3O4 ARATI KOLHATKAR, University of Houston, CHAMATH DANNANGODA, University of Texas at Brownsville, IVAN NEKRASHEVICH, DMITRI LITVINOV, RICHARD WILLSON, University of Houston, KAREN MARTIROSYAN, University of Texas at Brownsville, RANDALL LEE, University of Houston — This report describes synthesis of monocrystalline Fe3O4 nanocubes and polycrystalline nanospheres with tunable body diagonals and diameters via solvothermal and thermal decomposition reactions. The dimensions of the spherical MNPs were tuned to obtain particles for one set of spherical MNPs the volume was equivalent to that of a targeted cubic MNP volume and for a second set of spherical MNPs the diameter was equivalent to the body diagonal of a targeted batch of cubic MNPs. The PPMS was used to compare the magnetic properties of the synthesized spherical and cubic Fe3O4 MNPs on a volume and diameter/body diagonal basis. As compared to polycrystalline nanospheres, there is a higher saturation magnetization for nanocubes, which makes them more attractive for biosensing applications. The synthesized nanocubes also have a significantly higher coercivity as compared to their nanospherical counterparts with the same volume or equivalent diameter. This makes them more suitable for hyperthermia applications in which the heat generated varies linearly with coercivity. With this study, we demonstrate that shape is an important parameter that can be used to manipulate nanoscale magnetism in Fe3O4 MNPs in order to tailor them for a particular application.

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