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Structural and magnetic characterizations of organically prepared Fe_3O_4 nanoparticles KARINE CHESNEL, MATEA TREVINO, YANPING CAI, JARED HANCKOCK, ROGER HARRISON, Brigham Young University — Magnetite (Fe3O4) particles exhibit a superparamagnetic behavior when their size is in nanometer scale. Because of their small sizes, their ability to be manipulated by a magnetic field, and their compatibility with the human body, Fe3O4 nanoparticles can potentially be used in a wide range of applications in the medical field. Our goal is to investigate the magnetic properties in self-assemblies of such nanoparticles. We fabricate our Fe3O4 nanoparticle and characterize them by magnetometry measurements. We have investigated different preparation methods: an inorganic route, mixing salts or mixing solution, and an organic route.. XRD measurements show that the different methods lead to different sizes of particles, ranging from 5 nm to 50 nm in size. It also shows that the organic method leads to smaller particles of about 5nm, with a better size control. Magnetometry FC/ZFC measurements show a blocking temperature in the range of 100K to 200K. The smaller particles with better size control are then used to form a thin film. The particles are deposited on a substrate and just tend to form a lattice, here hexagonal lattice. The goal is to achieve one monolayer. The film is then used for synchrotron X-ray XMCD and XRMS measurements.

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