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Synthesizing and Size-Characteristics of Ferrofluids PONN MAHESWARANATHAN, JUSTIN TALBERT, Winthrop University — Ferrofluids are colloidal suspension of magnetic nanoparticles (10-100 nm) utilized in various applications for their unique magnetic and thermodynamic properties. Ferrofluids contain magnetite (Fe (II, III)$_3O_4$ or iron (II, III) oxide), a surfactant, and, in some cases a carrier. All traditional ferrofluid syntheses include a surfactant and establish that the surfactants play a significant role in their properties. In ferrofluid syntheses, a carrier is not always utilized and its role is not clearly investigated. In the presence of a magnetic field, the ferrofluid reacts to the magnetic field by creating "spikes"of different shapes which depends on the size of the magnetite particles. For this to occur, the magnetite particles must be around ten nanometers in diameter. Therefore, the size of magnetite particles created during synthesis determines the extent of the ferrofluid's magnetic and thermodynamic properties. In this research, ferrofluids were synthesized using different surfactants and carriers. In addition, how the size of magnetite particles affect the ferrofluid's magnetic and thermodynamic properties were analyzed. Preliminary results show that ferrofluids can be synthesized using various methods but the magnetic properties are not the same in each synthesis. Carriers were found to thin out the ferrofluid and provide a medium that creates less friction so that the ferrofluid can move around easier when a magnetic field is applied. Techniques like scanning (SEM) and transmission (TEM) electron microscopy and powder x-ray diffraction (XRD) were utilized to determine magnetite particle size.

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