

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Harmonic decomposition of magneto-optical signal from superparamagnetic Fe₃O₄ nanoparticles MAARIJ SYED, Rose-Hulman Institute of Technology, CODY PATTERSON, University of Michigan, YASUSHI TAKE-MURA, Yokohama National University — Superparamagnetic nanoparticles (SPNPs) are expected to play an increasingly important role in bio-imaging and therapy. These applications rely on understanding SPNPs magnetic properties which have been successfully characterized by AC Faraday rotation (FR). AC FR is used here to build on results presented earlier by measuring solutions of surfactant-coated magnetite nanoparticles. The setup employs a He-Ne laser, polarizing components, a sinusoidal B-field, and a lock-in detection scheme to measure the SPNPs FR. Such a setup provides a novel, economical way of determining important magnetic properties of SPNPs. The main intensity signal (1f) along with higher harmonics are collected and analyzed to calculate quantities such as the Verdet constant and the magnetic moment. We hope further analysis can also reveal details of size distribution and relaxation times of SPNPs. We will present results from samples with various concentrations as well as a particular concentration subjected to a range of B-field frequencies (between 800 Hz and 14 kHz). Findings are compared to results from more traditional techniques like magnetic susceptibility measurements, magnetic force microscopy, etc. We will also address the comparative advantages of this technique and its limitations.

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Date submitted: 08 Nov 2016

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