

Abstract Submitted  
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**Phase sensitive small angle neutron scattering** ERIK BROK, Univ. of Maryland, NIST, CHARLES F MAJKRZAK, KATHRYN KRYCKA, NIST — It is a well-known problem that information about the scattered wave is lost in scattering experiments because the measured quantity is the modulus squared of the complex wave function. This "phase problem" leads to ambiguity in determining the physical properties of the scattering sample. Small angle neutron scattering (SANS) is a useful technique for determining the structure of biomolecules, in particular proteins that cannot be crystallized and studied with x-ray crystallography. However, because the biomolecules are usually suspended in a liquid the observed scattering is an average of all possible orientations, making it difficult to obtain three dimensional structural information. In a proposed method polarized SANS and magnetic nanoparticle references attached to the sample molecules is used to obtain phase sensitive structural information and simultaneously circumvent the problem of orientational averaging (Majkrzak et al. J. Appl. Cryst. 47, 2014) If realized and perfected the technique is very promising for unambiguous determination of the three dimensional structure of biomolecules. We demonstrate the principles of our method and show the first experimental data obtained on a simple test system consisting of core shell magnetic nanoparticles.

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