

SMALL-ANGLE NEUTRON SCATTERING INVESTIGATION OF A FERROFLUID WITH ANISOMETRIC CuFe_2O_4 NANOPARTICLES

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Ferrofluids are colloidal liquids having strong magnetic features whose physical properties can be altered or controlled when exposed to a magnetic field [1,2].

Research in ferrofluid synthesis has considerably increased in the past 50 years. While a large number of research articles published in the early years might not be available online, there has been a large increase in publications in the last 20 years. There is a record in Google Scholar of the publication of 1500% more articles in the synthesis of ferrofluids during the years 2001–2021 compared to those during 1981–2000 [1], which reflects the growing interest in the synthesis and applications of these magnetic fluids.

Ferrofluids are being widely investigated for technical and biomedical applications including water treatment, energy harvesting and transfer, vibration control, magnetic electromagnetic wave absorption, energy storage applications, hyperthermia, magnetic drug delivery, biocatalysis, enzyme immobilization, DNA separation and purification, and magnetic resonance imaging non-invasive magnetic resonance imaging, etc [1,2,3,4,5,6,7]. Many of the chemical and physical properties associated to nanoparticles are strongly dependent on the nanoparticle shapes and dimensions. Recently, the manufacture of controlled form ferrite nanoparticles has become another requirement of interest for researchers [8,9,10,11].

In the present paper, a new ferrofluid with copper ferrite nanoparticles and aqueous media is investigated in terms of structural behavior. The nanoparticles obtained by coprecipitation are usually characterized by a homogeneous composition, predetermined stoichiometry and narrow size distribution. The novelty of the present variant of coprecipitation method lies in the type of the oxidant used for transformation of Fe (II) to Fe (III), relatively low temperature and a short reaction time [10].

Different approaches of the small-angle neutron scattering of ferrofluid with anisotropic nanoparticles are used for the microstructural characterization of the investigated system.

The results obtained are analyzed in comparison with the SANS results for isometric particle ferrofluids.

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