

Small-angle scattering investigations of ferrofluids with anisometric nanoparticles

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Ferrofluids are currently 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, etc. Many of the chemical and physical properties associated to nanoparticles are strongly dependent on the nanoparticle shapes and dimensions. Recently, the fabrication of ferrite nanoparticles in controlled diverse shape has become another requirement of interest for researchers for magneto-optical applications.

In the present work, accomplished using small-angle neutron and X-ray scattering techniques (SANS and SAXS), and performed on the YuMO instrument of the IBR-2 reactor, RIGAKU (MPhTI) and XEUSS 3.0 stations (FLNP), respectively, XRD at Empyrean (PANalytical) X-ray diffractometer (FLNP), new ferrofluids with anisometric nanoparticles in aqueous media are investigated in terms of structural aspect.

Joint studies of SANS and SAXS, as well as the use of various solvents (H₂O and D₂O), made it possible to obtain new information about the systems being analyzed, such as the shape and size of nanoparticles, the distribution of surfactants on their surface [1, 2] of high importance for the development of preparation protocols.

References

- [1] S.N. Lysenko, A.V. Lebedev, S.A. Astaf'eva et al., Preparation and magneto-optical behavior of ferrofluids with anisometric particles, *Physica Scripta* 95(4), 044007(2020). <https://doi.org/10.1088/1402-4896/ab6797>
- [2] M. Balasoiu, S. Astaf'eva, S. Lysenko et al., Small-Angle Scattering Investigation of a Ferrofluid with Anisometric Copper Ferrite Nanoparticles, *Journal of Surface Investigation: X-ray, Synchrotron and Neutron Techniques* 17(3), 730–737 (2023). <https://doi.org/10.1134/S1027451023030230>

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