# INTERACTION OF AGGREGATES IN FERROFLUIDS ACCORDING TO SMALL-ANGLE SCATTERING DATA

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Problems of studying various interaction effects between aggregates in real ferrofluids with a stable aggregation phase are considered. Small-angle scattering of X-rays and neutrons is the most direct experimental method for evaluating correlations on a scale from ~1 nm to ~100 nm. Even in highly stable ferrofluids (e.g. magnetic particles with single coating by surfactants in organic solvents); the aggregation phase can exist in thermodynamic equilibrium with monomeric particles because of competing interactions: magnetic attraction and Brownian repulsion between particles. In some cases, despite the presence of colloidal (non-equilibrium) aggregation in ferrofluids based on highly polar media (e.g. water), the systems remain stable in time. Compact colloidal clusters consisting of comparatively small number of particles in them are of current interest regarding some applications (e.g. magnetic hyperthermia) due to a specific behavior of magnetization different from that for purely superparamagnetic systems. In concentrated (but still stable) systems, a significant fraction of magnetic particles are in the aggregate state, which means that the clusters, interacting with each other in solution, start to contribute to the correlation effects reflected in small-angle scattering. This report is devoted to the analysis of these effects for concentrated water-based ferrofluids with double-layered surfactant (fatty acids) coating of magnetic nanoparticles [1].

[1] Nagornyi A.V., Socoliuc V., Petrenko V.I., Almasy L., Ivankov O.I., Avdeev M.V., Bulavin L.A., Vekas L., J. Magn. Magn. Mater. 501 (2020) 166445