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Structural investigation of ferrofluids under external electric fields by neutron scattering

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It is well known, the properties of magnetic fluids can be controlled by external magnetic field. However, inhomogeneous distribution of magnetic particles in non-polar ferrofluids was observed recently under external electric fields and formation of large aggregates was concluded in such systems. It was shown that aggregation process depends on the magnitude of the DC electric field, and in alternating electric fields with a frequency of more than 800 mHz, aggregates are not formed at all. Also, the detected anisotropy of the SANS signal at the detector indicates the preferred orientation of the aggregates of magnetic particles in ferrofluids. Impact of temperature on such aggregation was also checked by SANS and it was concluded that with temperature increase above 60 ℃, the aggregates formed in the electric field are destroyed. SANS with polarized neutrons was performed for detail study of the nuclear and magnetic structures in such systems. Behaviour of ferrofluids under external fields at different nanoparticles concentrations was investigated as well. The question of relaxation processes after switching off the field and returning the structure to its original state was considered.

Authors: FEOKTYSTOV, Artem; PETRENKO, Viktor (BCMaterials. Basque center for materials, applications & nanostructures); HONECKER, Dirk (ISIS Neutron and Muon Source); Mr KARPETS, Maksym (Institute of Experimental Physics SAS, Kosice, Slovakia); Dr RAJNAK, Michal (Institute of Experimental Physics SAS, Kosice, Slovakia); Dr AVDEEV, Mikhail (Joint Institute for Nuclear Research, Dubna, Russia); Dr TIMKO, Milan (Institute of Experimental Physics SAS, Kosice, Slovakia); Dr KOPCANSKY, Peter (Institute of Experimental Physics SAS, Kosice, Slovakia); PIPICH, Vitaliy

Presenter: PETRENKO, Viktor (BCMaterials. Basque center for materials, applications & nanostructures)

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