INVESTIGATING STRUCTURAL PERIODICITY OF SEGMENTED/NONSEGMENTED MAGNETIC NANOWIRE ARRAYS BY SANS METHOD

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The study of nanomagnetic materials is of great importance in scientific and industrial circles due to their use in many applications [1]. Numerous studies have revealed that magnetic properties are strongly correlated with geometrical parameters of used the system. For instance, size or diameters of 2D nanoparticles or the aspect ratio (Length to Diameters) of 3D systems like nanowires and nanorods are considerable parameters.

In the current study we applied small angle neutron scattering method at YuMO spectrometer to investigate structural periodicity of different series of segmented/non segmented magnetic nanowire arrays synthesised with different spatial ordered structure. Results showed that studied systems have 2D hexagonal lattice structure where position of given peaks allow to determine the periodicity for each series by deducing their lattice parameter.

It is quite important to investigate periodicity conservation of studied systems by considering averaging over orientations of porous arrays which is critical factor for application requirements as for information storage and acoustic sensors as well [2,3]. Results also considered very important for users of YuMO spectrometer studying similar systems, like nanoporous membranes or another with periodicity in the range (10 - 110 nm) [4] with reasonable accuracy.

[1] Krishnan KM. Fundamentals and applications of magnetic materials. Oxford University Press; 2016.
[2] Rial J., Proenca M.P. A Novel Design of a 3D Racetrack Memory Based on Functional Segments in Cylindrical Nanowire Arrays // Nanomaterials. 2020. Vol. 10, № 12. P. 403.
[4] McGary P.D. et al. Magnetic nanowires for acoustic sensors (invited) // J. Appl. Phys. 2006. Vol. 99, № 8. P. 08B310.
[5] A.A. Belogorlov, et al, Application of Small-Angle Neutron Scattering to Study the Filling of Nanoporous Material with a Nonwetting Liquid, // Physics of Atomic Nuclei, 2025, Vol. 88, No. 11, pp. 2288–2293.