Abstract Submitted
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Collective alignment of nanorods in thin Newtonian films[1] YU GU, RUSLAN BURTOVYY, JAMES TOWNSEND, Clemson University, JEFFERY OWENS, Air Force Reserach Laboratory, IGOR LUZINOV, KONSTANTIN KORNEV, Clemson University — We provide a complete analytical description of the alignment kinetics of magnetic nanorods in magnetic field. Nickel nanorods were formed by template electrochemical deposition in alumina membranes from a dispersion in a water–glycerol mixture. To ensure uniformity of the dispersion, the surface of the nickel nanorods was covered with polyvinylpyrrolidone (PVP). A 40–70 nm coating prevented aggregation of nanoroda. These modifications allowed us to control alignment of the nanorods in a magnetic field and test the proposed theory. An orientational distribution function of nanorods was introduced. We demonstrated that the 0.04% volume fraction of nanorods in the glycerol–water mixture behaves as a system of non-interacting particles. However, the kinetics of alignment of a nanorod assembly does not follow the predictions of the single-nanorod theory. The distribution function theory explains the kinetics of alignment of a nanorod assembly and shows the significance of the initial distribution of nanorods in the film. It can be used to develop an experimental protocol for controlled ordering of magnetic nanorods in thin films.

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