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Investigating Non-Equilibrium Fluctuations of Nanocolloids in a Magnetic Field Using Direct Imaging Methods[1] ASHLEY RICE, ANA OPRISAN, SORINEL OPRISAN, College of Charleston, RICE-OPRISAN COLLEGE OF CHARLESTON TEAM — Nanoparticles of iron oxide have a high surface area and can be controlled by an external magnetic field. Since they have a fast response to the applied magnetic field, these systems have been used for numerous in vivo applications, such as MRI contrast enhancement, tissue repair, immunoassay, detoxification of biological fluids, hyperthermia, drug delivery, and cell separation. We performed three direct imaging experiments in order to investigate the concentration-driven fluctuations using magnetic nanoparticles in the absence and in the presence of magnetic field. Our direct imaging experimental setup involved a glass cell filled with magnetic nanocolloidal suspension and water with the concentration gradient oriented against the gravitational field and a superluminescent diode (SLD) as the light source. Nonequilibrium concentration-driven fluctuations were recorded using a direct imaging technique. We used a dynamic structure factor algorithm for image processing in order to compute the structure factor and to find the power law exponents. We saw evidence of large concentration fluctuations and permanent magnetism. Further research will use the correlation time to approximate the diffusion coefficient for the free diffusion experiment.

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Ashley Rice
College of Charleston

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