STRINGS AND SHEETS IN ELECTRORHEOLOGICAL COMPLEX PLASMAS

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Strongly coupled electro (ER) - and magnetorheological (MR) systems are very different from "regular" complex fluids – the effective interparticle interaction is controlled by external fields and provides a tunable *anisotropic* contribution. ER/MR effect can be created in various systems including recently discovered ER plasmas[1].

The phase behavior of ER/MR systems is remarkable multi-faceted[2]. Remarkable example of the fluid transition occuring in such systems is the formation of particle strings aligned with the applied field – the so-called *"string" fluids"*. This phase differs simple and weakly anisotropic fluids due to long-range order along the field (see also Fig. 1). We develop an approach based on the Ornstein-Zernike equation which allows us to calculate structural properties. The results are in fairly goog agreement with Monte Carlo simulations.

ER plasmas can also be used to generate *negative dipolar* interparticle interactions (dust particles)[3]. Hence, two mechanisms are presented which drive the formation of sheets (Fig. 2) in ER plasmas.

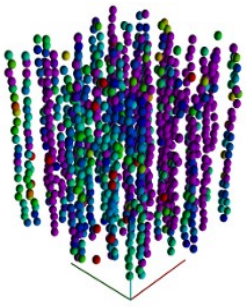

Fig 1: String fluid phase

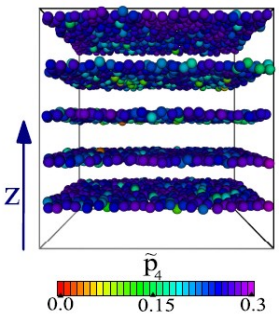

Fig.2:Phase of sheets

1. A. V. Ivlev et al., "First Observation of Electrorheological Plasmas", Phys. Rev. Lett.**100** 095003 (2008)
2. P. C. Brandt, A.V. Ivlev, and G. E. Morfill "Solid phases in electro- and magnetorhelogical complex systems", J. Chem. Phys. **130** 204513 (2009)
3. R. Kompaneets et al, "Design of new binary interaction classes in complex plasmas", Phys. Plasm. **16** 043705 (2009);