Abstract Submitted
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**Colloidal analogues of spin systems: Order and phase transitions in dense suspensions of magnetic ellipsoids**[1] PETER SCHURTENBERGER, ILYA MARTCHENKO, JEROME CRASSOUS, Lund University — We have determined the phase diagram of magnetic colloidal ellipsoids as a function of both packing fraction $\phi$ and external magnetic field $B$. We use core-shell particles with a magnetic core where the magnetic moment of the core is sufficiently small to avoid additional dipole-dipole interactions, but high enough to induce preferential particle alignment with an external magnetic field. By using a combination of small-angle x-ray scattering, microscopy and magnetometry we have examined positional correlations of the charged ellipsoids (aspect ratio $p = 2.7$) and orientational order of their magnetic moments. We establish structural criteria for the different phase and arrest transitions and map distinct isotropic, nematic and crystalline phases over an extended range of $\phi - B$ coordinates. We demonstrate that upon crystallization of the ellipsoids, the bulk magnetic behavior of the suspensions switches from superparamagnetic to ferromagnetic. We extend the often-used atom-colloid analogy to spin systems and present a relationship between the structural topology of suspensions of magnetic colloids and their macroscopic magnetic response.

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