Magnetic field-induced supracolloidal assemblies for micro-rheology applications

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Abstract
The emergence of novel materials and processing at the nanoscale has set the conditions for the fabrication of a wide range of nano-objects and multilevel nanostructured networks. In this communication we report a simple and versatile waterborne synthesis of magnetic nanowires following the innovative concept of electrostatic ''desalting transition''. Highly persistent superparamagnetic nanowires are generated from the controlled assembly of oppositely charged nanoparticles and polymers [1]. The particles considered for the assembly are 10 nm iron oxide particles. The wires have diameters of 200 nm and lengths comprised between 1 mm and 1/2 mm. The wires are rigid and able to reorient via the application of a magnetic field. In a second part, the nanowires are tested as probes for microrheology experiments. The mechanical responses of the complex fluids (Figure 1) and of the intracellular medium of cells is presented and compared to that of model viscoelastic liquids [2,3].

References
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Figures

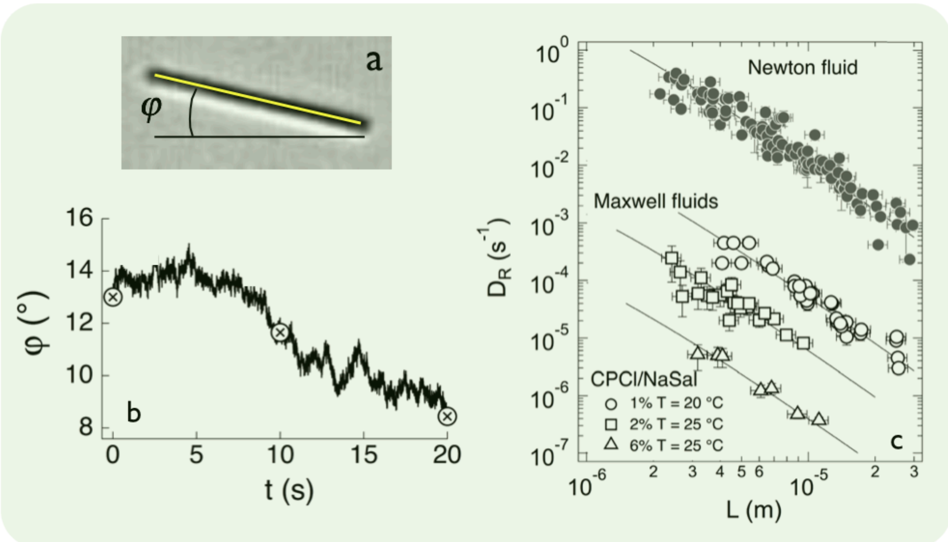

***Figure 1**: Images of a 9.2 µm long wire immersed in a wormlike micellar solution at c = 1 wt. %; (b): Time dependence of the orientation angle φ(t). (c): Rotational diffusion coefficient versus length for wires dispersed in a water/glycerol solution (labeled Newton fluid) and in micellar solutions (labeled Maxwell fluids). The rotational diffusion coefficient varies as $1/\eta L^3$, as indicated by the continuous lines, where L is the length of the wire and η the static viscosity.*