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YIELDING PHENOMENA IN LYOTROPIC PHASES OF CHARGED INTERCONNECTED BILAYERS

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The amphiphilic properties of surfactant molecules as AOT confer them the ability to form microstructures when mixed with an apolar solvent as Isooctane and a polar one as water. In concentrated regime, complex lyotropic liquid crystal phases with various degrees of order can be formed. The potential use of such system as template for the design of nanoporous materials and in other applications necessitates a complete characterization of their complex rheological properties. As a consequence, this study is focused on the characterization of the yielding phenomena occurring in a given lyotropic phase. Using polarized light microscopy, and X-ray scattering, the structures formed within an AOT/Isooctane/Water molecular system were identified as being bilayers. The distance between two monolayers is controlled by the relative amount of polar and apolar solvent. Cryo-electron microscopy and cryo-TEM indicate that these bilayers may be interconnected. Since no counter-ions are added in the system, Coulomb interactions exist between neighbouring bilayers which may be at the origin of the complex flow properties we have uncovered using conventional and optic rheometry. The results of preliminary stress and strain controlled measurements have shown that a steady and reproducible state is reached after a complex transient regime as long as the applied stress remains in the range, 5Pa to 30Pa. This allows us to define a reliable creep procedure to characterize the flow properties of the material. The ensuing results show the existence of a yield stress defining two regimes of stresses where the material behaves either as a solid or as a liquid.