

How the formation of ultra-soft microemulsions affects dynamical properties at different lengthscales

Tuesday, 16 December 2025 17:00 (20 minutes)

This study focuses into the molecular dynamics of the ternary ethanol-octanol-water mixture, selected for its well-defined structure across critical point fluctuations, pre-Ouzo, and Ouzo phases, with organization occurring on a mesoscopic scale of a few nanometers. Using a combination of Neutron Scattering, NMR, rheology, and classical molecular simulations, we present a detailed description of molecular dynamics across structural domains. A subtle shift in individual dynamics marks the boundary of the monophasic meso-structured region, helping to identify the dynamic signature of the so-called Lifshitz line. Neutron Spin-Echo experiments reveal the collective nature of molecular dynamics, with a de Gennes narrowing effect slowing diffusion in the nano-structured octanol rich region and a dramatic slowdown in droplet diffusion in the pre-Ouzo zone. We eventually discuss a methods for the estimation of the droplets lifetime in such transient organisation, here close to 20 nanoseconds.

Abstract Title

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Session Classification: Talks