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Self-assembled anisotropic polymer particles by polycondensation in lyotropic surfactant mesophases GURUSWAMY KUMARASWAMY, National Chemical Laboratory, Pune, MOHAN WADEKAR — We report the formation of crosslinked polysiloxane particles whose morphologies are directed by the nonionic surfactant phase in which they self-assemble. Under conditions that allow slow condensation of silanol monomers, the polymer particles formed have a geometry similar to the parent mesophase: rod-like particles form in a hexagonal mesophase and sheet-like in a lamellar phase. The characteristic diffraction pattern obtained from the liquid crystalline surfactant assembly is preserved during polycondensation. Interestingly, while the geometry of the particle is similar to that of the mesophase, the particles are microns in size, three orders of magnitude larger than the characteristic size of the surfactant mesophase. Our observed morpholgies differ from those predicted by theories of ordering of colloidal particles in liquid crystalline phases. In our system too, ordering of polymer colloid particles is a result of minimization of elastic free energy due to distortion of the nematic matrix. However, the polymer particles in our experiments are not formed at once, but grow slowly as polycondensation proceeds. We speculate that slow condensation and cross-linking kinetics, gradual build-up of molecular weight and the non-linear architecture of the polysiloxane molecules might allow the dynamic organization of the particles by the liquid crystalline mesophase, leading to the formation of the observed particle geometries.

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