

Crystallization of silver carboxylates from sodium carboxylate mixtures

Silver carboxylates can be made by the reaction of silver nitrate and the corresponding sodium carboxylates. The length of the alkyl chain has a significant impact on the product behavior. In this study, 18, 20, and 22 carbon chains (stearate, arachidate, and behenate, respectively) have been selected. All three sodium carboxylates are very insoluble in water at room temperature. Solutions are obtained above the Krafft temperature, which precipitates lamellar crystals if cooled at the proper cooling rate. Depending on the chain length, metastable morphologies, such as vesicles and tiny fibers, can be seen consecutively before hexagonal plates form. The carboxylate with the shorter chain length reaches equilibrium more quickly. All three silver carboxylates also take on a lamellar structure. Small-angle X-ray scattering (SAXS) shows that the d spacing of the crystals increases as the chain length increases. Cryo-TEM illustrates that the crystallites are the result of micelle nucleation and micelle aggregation. In addition, the crystallization process in the presence of silver bromide nanocrystals has been investigated. In the initial stage, an epitaxial interface is formed between the silver carboxylate crystallites and the cubic silver bromide grains. Budlike and strandlike structures grow because of it. The consequent strand enclosure restrains the crystal growth, which reduces the size and changes the morphology of the crystals.