Polymer-Directed Crystallization of Organic Molecules

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There are non-classical pathways of crystallization via colloidal intermediates and subsequent mesoscale transformation in many crystallization processes. With polymeric additives, self-organization can be stopped at an intermediary step -a mesocrystal- in which the primary crystal units can still be identified. Mesocrystal intermediates can also lead by fusion to the formation of single crystals with included polymeric additives, sometimes allowing the observation of highly oriented nano-particle-based intermediates. The influence of polymers on crystal formation is usually attributed to their selective adsorption and/or enrichment onto specific crystal faces, similar to that seen with low molecular weight ionic compounds, which inhibits the growth of these faces. Polymer-surface interactions increase colloidal stability, thereby influencing the size and shape of the primary clusters. To understand the effects and relevant parameters for the formation of mesocrystals, the crystallization of charged organic molecules with oppositely charged polymeric additives was performed. The results indicate that the mesocrystals are formed by a polymer-induced structuring process.