

Organic crystallization mechanisms elucidated by electron microscopy

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Organic and protein crystallization proceeding via a variety of intermediates was studied using direct cryo-TEM and 4D STEM imaging. It revealed complex, gradual order evolution processes that can be understood and controlled in terms of crystal morphology and polymorphism. We observed that organic crystallization consists of a series of supramolecular transformations that are connected and follow a clear hierarchy starting from the molecular-scale interactions. Description of the mechanisms in terms of classical/nonclassical dichotomy is incomplete, and we advance the idea of a spectrum of states involved in crystallization, going beyond this dichotomy.