Seeding

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Abstract: The initial formation of crystalline nuclei remains the critical barrier to success and these approaches can be time consuming. Major efforts have been done to facilitate and control nucleation by controlling factors such as concentration, temperature, pH, precipitants, additives, and detergents. The use of external stimuli, such as an electric or magnetic field, ultrasonication, microgravity, etc has also been explore. Amongst these approaches, seeding represents a critical step in optimising crystallisation process. Seeding, in its most basic form, refers to the addition of crystals of the desired solute, generated from previous crystallisation experiments, into a supersaturated, but metastable, solution. The seeding method involves utilising either macromolecular crystalline seeds, dissolved additives (soft templates), or undissolved additives (hard templates). The underlying principles of these methods primarily rely on three fundamental mechanisms: functional group matching, epitaxy, and topographical effects, all of which are extensively discussed in this chapter. By controlling the supersaturation and the mass of crystal seeds added, one can prevent excessive primary or secondary nucleation and promote growth of the seeds. Such a process has been used ubiquitously for small molecules, as it allows for enhanced control of the crystallisation process. The size distribution of the seeds can be controlled via sieving or equivalent methods to ensure that seeds are as monodisperse as possible, which in turn allows for further control over the final size of the crystals grown in the seeded experiment. In this lecture on seeding, aspects of crystal nucleation, yield, understand the importance of seeding, seed quality, cross-seeding and crystallisation methods employed will be discussed.

Keywords: Nucleation; Crystallisation; CNT; Seeding; Yield