Elucidating the Thermodynamic and Kinetic Factors Governing Zeolite Crystallization

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The ability to selectively control zeolite crystallization to achieve desired material properties requires detailed understandings of the thermodynamic and kinetic factors regulating crystal nucleation and growth. In this talk I will discuss two general mechanisms of crystal growth: (1) classical pathways involving 2-dimensional layer nucleation and advancement on crystal surfaces through monomer addition; and (2) nonclassical pathways, termed *crystallization by particle attachment* (CPA)[1], involving the formation of metastable precursors[2]. Here, I will highlight the impact that Alex Navrotsky's studies have had on this field to better understand the thermodynamic processes of amorphous precursor self-assembly and evolution[3-6], the relative energetics of zeolite formation[7], and processes associated with intercrystalline transformations that are commonly observed (and selectively utilized) in zeolite synthesis[8]. These findings have also helped clarify the mechanistic pathways of zeolite crystallization, which will be discussed in the context of recent *in situ* atomic force microscopy (AFM) studies.

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