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The chemistry of nucleation

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Nucleation phenomena are of critical importance in numerous areas of science and everyday life. The prevailing models to explain nucleation are based on thermodynamic arguments without consideration of the chemical nature of the specific system. Even though newer models include system dependent variables then quantitative atomistic differences between systems are largely ignored, and nucleation processes are treated on a "particle" or "monomer" level without discussion of the atomic scale "chemistry of nucleation". In situ studies of solvothermal reactions have provided experimental insight into nucleation and growth of nanocrystals [1], and recently the measurement of X-ray total scattering data and subsequent pair distribution function analysis has become a useful tool to obtain atomic scale information during crystal formation processes [2]. In situ results for different material systems reveal a fascinating chemical richness spanning from mono-metal to complex polymer precursor species, which through system dependent multi-step reactions mechanism develop into pristine nanocrystals [1,3].

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