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A non-LSW Model for Semiconductor Nanocrystal Growth
MICHAEL CLARK, SANAT KUMAR, JONATHAN OWEN, Columbia University, D.D. SARMA, India Institute of Science — While the efficient production of nanocrystals has been studied for decades, the mechanism by which the nanocrystals grow is still poorly understood. Current models do not extend far beyond the very general Lifshitz-Slyozov-Wagner theory of grain growth. Unfortunately, many nanocrystal materials do not rigorously obey Lifshitz-Slyozov-Wagner dynamics, specifically materials such as ZnO and CdSe in certain growth conditions. In an effort to understand these materials better, we approach the nanocrystal growth problem *ab initio* by including the fact that the precursor molecule is being chemically produced as the nanocrystals are being formed. We apply this assumption to the kinetics of nanocrystal growth, and develop an analytical derivation of the time-dependent size distribution of nanocrystals in this scenario. With this mathematical model, we compare our results directly to nanocrystal experiments for ZnO and for CdSe, where both the average and FHWM of the size distribution evolve with time, to determine the chemical mechanism underlying the formation of these materials.

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