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Modeling Digestive and Ostwald Ripening of Nanocrystals
MICHAEL TAMBASCO, Columbia University, SANAT KUMAR — Ostwald and digestive ripening are two diametrically opposite phenomena that dramatically impact nanocrystal polydispersity. Ostwald ripening allows for large nanocrystals to grow at the expense of small ones, while digestive ripening involves the propagation of small nanocrystals at the cost of the larger. A detailed theoretical description of these two processes would aid in developing techniques that control nanocrystal size and polydispersity; however, there currently exists no a-priori means of describing the physics of these two processes. Here, we present an approach that is capable of characterizing both types of phenomena. We apply a mean field theory in order to model the role that ligands play in the ripening processes. We examine the effects of ligand concentration and chain length on the average size and size distribution of gold nanocrystals. We then employ potentials derived from the theoretical results in Monte Carlo simulations of the ripening processes in order to study the physics of the ripening phenomena.

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