



## **Interactions of anionic polyelectrolytes with crystal lattice ions, from the nucleus to the crystal.**

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**It is known that the polymeric matrices present in the mineralized tissues interact from solution with the growing calcium carbonate crystals and are responsible for both nucleation and inhibition of mineral crystallization. Such organic-inorganic interactions lead to highly optimized organic-inorganic hybrid materials, often with hierarchical ordering over several length scales through the process of Biomineralization. The aim of the present work is to mimic such processes in order to highlight the mechanisms by which the polymeric matrix affects the morphology, the size, and the crystalline structure of the mineral. Therefore a series of anionic polyelectrolytes having various molecular weights and monomer structures were used as additives in the calcium carbonate crystallization from supersaturated solutions. It should be emphasized that the calcium carbonate default morphology and structure (i.e. obtained in the absence of any additives) are, respectively, rhombohedral and calcite. However, the final calcium carbonate particles prepared here in the presence of various polyelectrolytes result from the aggregation of nanocrystals. Further, the particle sizes are found to range from few hundreds of nanometers to micrometers. We developed various analytical methods to evaluate the interaction between the polyelectrolytes and the calcium ions. In addition, turbidity, dynamic light scattering, X-ray diffraction, and electronic microscopy measurements were used to determine, respectively, the induction time, the crystal size, the nanocrystal structure, and the particle morphology. The effects of polyelectrolytes on the morphogenesis of calcium carbonate are clearly demonstrated.**