

Lattice Distortions, Strain and Stress in Biologically Formed Crystals

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Biologically formed crystals often demonstrate superior properties as compared to their non-biological counterparts. Moreover, organisms exert high control over the nucleation and growth of crystals for the production of abundant specific functions. This control is achieved by specific organic molecules, both in the form of templates and growth-modifying additives. There are over 70 biologically formed minerals known to date, however the most abundant one is calcium carbonate. Despite numerous studies the structure and microstructure of these crystals is yet not fully understood. In this talk I will show, based on synchrotron high-resolution powder diffraction that a general phenomenon prevails, namely, that the lattice of biogenic CaCO_3 is anisotropically distorted due to the presence of organic molecules. I will also show that these organic molecules induce a very unusual material microstructure by amazingly engineering the organic/inorganic interfaces. These findings further elucidate how these biomineralized-masterpieces are built and produced. I believe that these observations will also be utilized in future biomimetic materials so as to improve their characteristics.