

## **Biomimetic Nucleation and Growth of Inorganic Crystals on PDAC/PSS Self-Assembled Multilayers**

Z. W. Du, J. L. Hao and H. R. Li

*National Key Laboratory of Biochemical Engineering, Institute of Process Engineering,  
Chinese Academy of Sciences, Beijing 100080, P. R. China*

*E-mail: [zwdu@home.ipe.ac.cn](mailto:zwdu@home.ipe.ac.cn)*

### **ABSTRACT**

The structure of the shell is controlled through interactions between inorganic and organic materials in a process generally known as biomineralization. In this paper is presented the fabrication of biomimetic laminated composite by mimicking the cyclical matrix control processes to form the highly structured Mollusca nacre. (PDAC/PSS)<sub>n</sub> (n is the number of the bilayers) self-assembled multilayers as matrices were built-up through alternative absorption of polycation and polyanion to a substrate and their chemical structure were characterized by UV-Vis absorption spectroscopy. Then, deposition of CaCO<sub>3</sub> took place on the multilayers by dipping them into a supersaturated CaCO<sub>3</sub> solution. The crystal morphology and the structure of the CaCO<sub>3</sub> were characterized by SEM and X-ray diffraction respectively. The crystallization process shows significant dependence on the bilayer growth and crystals of the CaCO<sub>3</sub> on different films showed quite different morphology. With (PDAC/PSS)<sub>15</sub> the hexagonal crystals of CaCO<sub>3</sub> with the pellet size of 10~15μm, which were very similar to the crystals existed in nacre, was obtained after 1.5 h deposition. Therefore there are heterogeneous nucleation site on the polyelectrolyte layers to initiate the crystallization and act as a mediator to the inorganic crystals deposited on them.

**Keywords:** Self-assembled multiplayer, calcium carbonate, biomimetic biomineralization and nacre.