



RISUD RESEARCH SALON

Structural Characterization of Biominerals and the Associated Precursor Materials using Solid-State NMR Spectroscopy

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ABSTRACT

Biomineralization is a process describing the formation of composite materials in organisms such as teeth, bone, and shell. It is a particularly challenging research area because biomaterials usually comprise organic and inorganic components. Solid-state NMR spectroscopy, being applicable to crystalline or amorphous systems, is well suited to study the structures of biominerals at the molecular level. We will discuss three aspects of biomineralization. First, the molecular structure of some teeth samples will be presented, focusing on the characterization and quantification of various phosphate species. Matrix vesicles have been suggested as the initial site of calcification in skeletal tissues. The mineral phase within a matrix vesicle has been identified as an amorphous mixture of orthophosphate and hydrogen phosphate ions. In the second part of this talk, we will discuss the precipitation process of calcium phosphate in liposomes to shed light on the pathway of the calcification process in matrix vesicles. On the basis of the ^{31}P NMR spin-diffusion method, direct evidence is given to support that the formation of the apatite phase within liposomes occurs via the solid-state transformation of the disordered phase. Finally, we will discuss the structure of amorphous calcium carbonate (ACC). Biogenic ACCs play a crucial role in the mineralization process of calcareous tissue. Most biogenic ACCs contain Mg ions but the coordination environment of Mg, which may influence the kinetics of the phase transformation of an ACC, remains poorly understood. We will demonstrate how we could characterize the structural order of Mg-ACC by advanced NMR techniques.

Date: 31 October 2017 (Tuesday)

Time: 12:00 n.n. - 2:00 p.m.

Venue: Room ZS1215, 12/F, Block Z,
The Hong Kong Polytechnic University,
181 Chatham Road South,
Hung Hom, Kowloon

SPEAKER'S BIOGRAPHY

Professor Jerry C. C. Chan is currently a faculty member of the Department of Chemistry at National Taiwan University. He has two major research projects ongoing. The first one concerns the structural elucidation of protein aggregates associated with neurodegenerative diseases such as Alzheimer's disease, for which chemical methods are being developed to control the aggregation pathways of the target proteins. The oligomeric peptide aggregates are subsequently characterized at the molecular level, hoping to unravel the underlying biophysical principles governing the formation process. The carefully prepared protein/peptides aggregates could also serve as models for the therapeutic targets or diagnostic biomarkers of various neurological disorders. The second project focuses on the molecular mechanism of biomineralization. The motivation is to understand in detail the mineralization process in organisms so that materials with novel structure and properties could be developed. A large variety of physical methods are used to study the target systems, with particular emphasis on solid-state nuclear magnetic resonance spectroscopy. Prof. Chan had served in the editorial board of the journal of Solid State NMR (Elsevier) in the period of 2009—2016 and he was appointed as the editor of the Trends section from 2009—2013, aiming to highlight the cutting-edge development of the field.

*** All Interested Are Welcome ***

For further information, please contact Dr. Ben Leu at Tel. 3400-8322.

Registration: <https://www.polyu.edu.hk/mysurvey/index.php/143563> (Free admission)

Registration deadline: 30 October 2017, 12:00 n.n.

Confirmation Note of Attendance will be provided to registered participants if they attend the whole lecture.