グローバル COE 物質科学イノベーション講演会

演 題： **”Functional materials converted from nature templates”**

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日 時：2012 年 1 月 16 日（月）10:00～11:00

場 所：工学部 B11 講義室

Scientists are always amazed by the biological materials, which are characterized by unique structures and morphologies. Inspired by nature, scientists struggle to fabricate artificial structures with certain functions in a biomimetic way. There has been a great interest in using biomaterials with subtle hierarchical structures as biotemplates to fabricate biomorphic inorganic materials. In recent years, different biotemplating technologies have been developed for the conversion of biological templates into biomorphic ceramics.

In this presentation, the latest developments in this field will be discussed. The review is organized into four parts. In the first part, versatile inorganic materials using different wood issues as templates will be discussed. Our team has prepared wood-templated metal composites (e.g. SiC/Al), metal oxides (e.g. NiO, ZnO, Co_3O_4), rare earth metal oxide (e.g. Y_2O_3, Ce_2O_3) and composite oxide successfully by the wood-templating method. These porous functional materilas have great potencial as catalyst and gas sensors. The second part will give an overview on the butterfly wings microstructure materials. By using various target metal salt as precursor, our group fabricated various metal oxides replica using the scales as templates in our previous work. Based on the electron microscopy analysis, the method we used would obtain better wing scales replicas than the sol-gel process and nanoparticle infiltration method mentioned above. According our optical measurements and simulations, some unique optical properties of these functional oxides with butterfly wings structures have been intensively studied before. The third part will give an intensive review on the latest developments on how to create inorganic materials with unusual structural specialty and complexity using the some cast-off materials (e.g. rice husk, leaves, eggshell) membrane as the templates, whereas the last part deals with investigations on the bacteria transforms by various analytical techniques.

As described in this review, significant developments have been made in morph-genetic materials during the last years. The field continues to grow internationally and contribute to new interdisciplinary areas concerned with the synthesis, self-assembly and processing of organized matter across arrange of length scales. A wide range of soft, hard, or hybrid materials and interfaces are being explored with the promise of diverse applications in bioceramic implants, bio-nanotechnology, nanochemistry, and environmentally benign routes to functional materials.

本講演は『化学研究先端講義／総合化学特別研究第二』の一部として認定されています。

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