

Biological Blueprints Towards Next Generation Advanced Materials

言語 / 英語 Language/English

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東京農工大学 小金井キャンパス 11号館5階 L1153
Lecture Room L1153, 5th Floor, Building 11, Koganei Campus, TUAT



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For centuries, engineers have strived to make materials that are stronger, lighter and more efficient. However, all of the processing of these materials has come at a tremendous cost to our environment. Before we even existed, Natural systems have developed well-orchestrated strategies, exemplified in the biological tissues of numerous animal and plant species, to synthesize and construct materials from a limited selection of available starting materials. The resulting structures display multiscale architectures with incredible fidelity and often exhibit properties that are similar, and frequently superior to, mechanical properties exhibited by many engineering materials. These biological systems modulate these controlled syntheses and hierarchical assembly often by using organic scaffolds and structure-directing agents, combined with ions, clusters and nano-scaled building blocks that are integrated into macroscale structures.

We are investigating a variety of organisms that have taken advantage of hundreds of millions of years of evolutionary changes to derive structures, which are not only strong and tough, but also demonstrate the ability to articulate as well as display multifunctional features including damage sensing and self-cooling. We discuss the mechanical properties and functionality stemming from these hierarchical features as well as how they are formed. From the investigation of synthesis-structure-property relationships in these unique organisms, we are now developing and fabricating cost-effective and environmentally friendly advanced nanomaterials for energy conversion and storage, as well as water purification. We utilize organic materials as templates to regulate nucleation and growth modes of inorganic components that result in controlled particle size, phase and surface area that ultimately dictate performance in energy and structural based materials.

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Everyone is welcome to attend.