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Bio-inspired functional materials templated from nature species

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Biological materials naturally display an astonishing variety of sophisticated nanostructures that are difficult to obtain even with the most technologically advanced synthetic methodologies. Inspired from nature materials with hierarchical structures, many functional materials are developed based on the templating synthesis method. This review will introduce the way to fabricate novel functional materials based on nature bio-structures with a great diversity of morphologies, in State Key Lab of Metal Matrix Composites, Shanghai Jiao Tong University in near five years. We focused on replicating the morphological characteristics and the functionality of a biological species (e.g. wood, agriculture castoff, butterfly wings). We change their original components into our desired materials with original morphologies faithfully kept. Properties of the obtained materials are studied in details. Based on these results, we discuss the possibility of using these materials in photonic control, solar cells, electromagnetic shielding, energy harvesting, and gas sensitive devices, et al. In addition, the fabrication method could be applied to other nature substrate template and inorganic systems that could eventually lead to the production of optical, magnetic, or electric devices or components as building blocks for nanoelectronic, magnetic, or photonic integrated systems. These bioinspired functional materials with improved performance characteristics are becoming increasing important, which will have great values on the development on structural function materials in the near future.

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