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Bioinspired materials templates by nature species

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After millions of years' evolution, natural species have developed an astonishing variety of sophisticated nanostructures that are difficult to fabricate even with the most technologically advanced synthetic methodologies. Inspired from natural materials with hierarchical structures, many functional materials are developed using various templating methods. This review will introduce how to fabricate novel functional materials based on natural bio-structures with a great diversity of morphologies, in State Key Lab of Metal Matrix Composites, Shanghai Jiao Tong University in the latest five years. We will focus on replicating the natural component with functional inorganic materials while maintaining the morphologies of the biological species (e.g. wood, agriculture castoff, butterfly wings). Properties of the as-required materials will be systematically studied. Based on these results, we will discuss the potential applications of these materials in manipulation of light propagation, solar cells, electromagnetic shielding, energy conversion, and gas sensors, et al. In addition, the fabrication methods could also be applied to many other natural templates that could eventually lead to the production of optical, magnetic, and electric devices as building blocks for nano-electronic, magnetic, or photonic integrated systems. These bioinspired functional materials with improved performances are becoming increasingly important, which will be extremely valuable in developing functional materials with novel nano-morphologies in the near future.

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