Morphosynthesis of complex metal carbide forms using biotemplates

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Biological structures are distinguished by the extremely high precision of their self-assembly, replication, and functionality. Diatoms, bacteria, cornstarch, pollen, and wood have been used for the biomimetic synthesis of a range of organized inorganic architectures with potential applications in catalysis, magnetism, separation science, electronics, and photonics. In this paper, we describe a facile method for replicating the complex surface structures of wood, tree and grass pollen grains, and rice hull, which in the case of metal carbide produces complex hierarchical cellular structure morphology with surface areas high than 250 m^2/g. Such materials show highly nanocrystalline (100–500nm) in particle size and extreme thermal stability up to 1500ºC in air. The synthetic procedures and surface characterizations including microscopic measurements will be presented in detail.