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LARGE-SCALE SYNTHESIS OF HIERARCHICALLY MESOPOROUS PHOSPHATES USING YEAST CELLS AS CATALYTIC TEMPLATES

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Abstract

Based on the principles of microbial fermentation, cytoarchitectonics and biomineralization, we established a novel synthetic method, by which the multilevel nanostructure of yeast cell tissues can be copied by phosphates. Taking living yeast cells as catalytic templates and reactors, a series of hierarchically mesoporous phosphate materials with complex surface shapes were obtained, and their scale-up experiments were carried out. The structure and composition of the synthesized mesoporous phosphate materials show a good reproducibility, and the materials can be produced in a large scale. The present approach has numerous advantages such as mild reaction condition, simple process, no pollution, easy implementation in industrial production. These hierarchically mesoporous phosphate materials exhibit a unique fluorescence enhancement effect, and have the performance of transfection fluorescence to bone marrow stem cells of rat, onion cells, Saccharomyces cerevisiae, Aspergillus oryzae and Escherichia coli. They also possess a pronounced function in loading and slowly releasing insoluble drug, and a better electro-catalytic activity than commercialized MnO_2 catalyst. These synthetic materials can be used for fluorescent labeling and drug delivery. They can also be used for making oxygen electrode materials of bio-sensors, metal-air battery, and fuel cell.

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