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Review on a large-pore of mesostructured cellular foam (MCF) silica and its applications

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Abstract

The unique properties of mesostructured cellular foam (MCF) silica such as: large pore size, continuous three-dimensional (3D) pore system and hydrothermal robust allow favourable conditions for the incorporations of high amount of active sites or immobilizations of enzymes to produce modified MCF silica in the forms of catalysts, biocatalysts and adsorbents. Recently, the modified MCF silicas were reported to be efficient catalysts for hydrogenation of phenylacetylene, heck coupling reaction of arylboronic acid etc. Biocatalysts derived from modified MCF silicas were found to be potential for conversion of glucose to gluconic acid, hydrolysis of N-benzoyl-DLarginine-p-nitroanilide (BAPNA) and casein, transesterification of racemic 1 phenyl- ethanol and hydrolytic reaction of tributyrin and triacetin etc. Several separation process such as CO_2 capture and adsorption of biomolecule (L-tryptophan, lysozyme, bovine serum) were sucessfully conducted using adsorbents derived from modified MCF silicas. This paper reviews synthesis of the MCF silica material and incorporation of active sites or immobilization of enzymes in this material. Besides that, detailed understandings on characterization of the modified MCF silicas, which include pore sizes, active sites/enzymes sizes, amount of active sites/enzymes bound with the MCF silica, were also discussed to obtain their potentialities as catalysts, biocatalysts and adsorbents. The review paper also describes recent progress on the applications of the MCF silica.

Keywords: Mesostructured Cellular Foam (MCF), Catalyst Incorporation, Enzyme Immobilization, Adsorbent, Characterizations.