

Fundamentals and recent progress relating to the fabrication, functionalization and characterization of mesostructured materials using diverse synthetic methodologies

ABSTRACT

Since 1990 and the invention of the very first generation of ordered mesoporous silica materials, several innovative methodologies have been applied to synthesize, characterize, and modify silica/non-silica mesoporous materials. The growth of the mesoporous materials field has generated significant environmental and economic advantages compared to various other industrial developments. According to the literature, there are several key synthesis approaches and parameters that can affect the structural, textural and morphological characteristics of mesoporous materials. To date, huge attempts have been made to maximize the activities and selectivities of these materials through either the in situ or post-synthesis functionalization of the large interior surface areas and internal mesostructured frameworks in the presence of specific organic/inorganic components. However, the main challenge is to provide good control over the incorporation and distribution of multiple guest components within the mesostructured hosts. Mesostructured materials have received great attention for various applications, such as being used in electronics, medicine, photocatalysis, catalyst supports, catalysis, absorbers, sensors, gas separation, etc. In the current paper, several recent developments have been highlighted and reviewed regarding the fabrication and characterization of siliceous/non-siliceous mesoporous materials via various synthetic approaches. Furthermore, the availability of diverse functionalization methods has been reviewed to provide comprehensive approaches for synthesizing new generations of suitably modified mesoporous materials with superior structural, physicochemical, and textural characteristics.

Keyword: Ammonia; Silica; Photocatalysis