Facile synthesis of tunable dendritic fibrous SBA-15 (DFSBA-15) with radial wrinkle structure

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ABSTRACT

In this study, typical mesoporous hexagonal rod-typed SBA-15 was successfully transformed into spherical shape with additional dendrimers, namely Dendritic Fibrous SBA-15 (DFSBA-15) by employing microwave-assisted microemulsion system. Physiochemical properties of DFSBA-15 were greatly influenced by aging temperature, urea/TEOS ratio, co-surfactant types, and aging time. It was found that the co-surfactant types were insignificant in controlling the pore size, while the aging conditions (temperature and time) were significant in controlling the fiber density. The analysis results (XRD, N_2 physisorption, FTIR, and TEM) confirmed the optimal conditions for DFSBA-15 synthesis were at aging temperature of 100 °C, urea/TEOS ratio of 0.5, *n*-butanol as co-surfactant, and aging time of 12 h. The as-synthesized optimized DFSBA-15 was compared with the conventional SBA-15 via XRD, N_2 physisorption, FTIR, CO_2-TPD, NH_3-TPD, TGA, TEM, and FESEM-EDX. As compared, DFSBA-15 rendered vast accessibility to the adsorption sites, higher basicity (≈86% enhancement) and acidity (≈66% enhancement), abundant siliceous framework and higher thermal stability (≈19% enhancement), owing to its radially oriented pores which elongated to the outer surface from the nucleus of its sphere. The outcome of this study anticipated the wide applications of DFSBA-15 in catalysis and biomedical fields by revealing the facile protocols of optimal DFSBA-15 synthesis.

KEYWORDS

Dendritic fibrous SBA-15; Morphology transformation; Tunable properties

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