World Academy of Science, Engineering and Technology
International Journal of Chemical and Molecular Engineering
Vol:18, No:12, 2024

Investigating Methanol Interaction on Hexagonal Ceria-BTC Microrods

Authors : Jamshid Hussain, Kuen Song Lin

Abstract : For prospective applications, chemists and materials scientists are particularly interested in creating 3D-micro/nanocomposite structures with shapes and unique characteristics. Ceria has recently been produced with a variety of morphologies, including one-dimensional structures (nanoparticles, nanorods, nanowires, and nanotubes). It is anticipated that this material can be used in different fields, such as catalysis, methanol decomposition, carbon monoxide oxidation, optical materials, and environmental protection. Distinct three-dimensional hydrated ceria-BTC (CeO_2-1,3,5-Benzenetricarboxylic-acid) microstructures were successfully synthesized via a hydrothermal route in an aqueous solution. FE-SEM and XRD patterns reveal that a ceria-BTC framework diameter and length are approximately 1.45–2.4 and 5.5–6.5 µm, respectively, at 130 oC and with pH 2 for 72 h. It was demonstrated that the reaction conditions affected the 3D ceria-BTC architecture. The hexagonal ceria-BTC microrod comprises organic linkers, which are transformed into hierarchical ceria microrod in the presences of air at 400 oC was confirmed by Fourier transform infrared spectroscopy. The Ce-O bonding of the hierarchical ceria microrod (HCMs) species has a bond distance and coordination number of 2.44 and 6.89, respectively, which attenuates the EXAFS spectra. Compared to the ceria powder, the HCMs produced more oxygen vacancies and Ce3+ as shown by the XPS and XANES/EXAFS analyses.

Keywords : hierarchical ceria microrod, three-dimensional ceria, methanol decomposition, reaction mechanism, XANES/EXAFS
Conference Title : ICCME 2024 : International Conference on Chemical and Molecular Engineering
Conference Location : Cairo, Egypt
Conference Dates : December 16-17, 2024