

Rapid one pot synthesis of mesoporous ceria nanoparticles by sol-gel method for enhanced CO₂ capture

Ahmad Aiman Azmi^a, Norzita Ngadi^a, Mohd Johari Kamaruddin^a, Zaki Yamani Zakaria^a, Lee Peng Teh^b, Nur Hazirah Rozali Annuar^c, Herma Dina Setiabudi^d, Aishah Abdul Jalil^e, Muhammad Arif Ab Aziz^a

^aSchool of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia

^bCentre for Advanced Materials and Renewable Resources, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia.

^cDepartment of Chemistry, Faculty of Applied Science, Universiti Teknologi MARA (UiTM) Johor, Pasir Gudang Campus, 81750 Masai, Johor, Malaysia

^dCentre of Excellence for Advanced Research in Fluid Flow, Universiti Malaysia Pahang, 26300 Gambang, Kuantan, Pahang, Malaysia.

^eCentre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia m.arif@utm.my

ABSTRACT

The capture and storage of CO₂ have been suggested as an effective strategy to reduce the global emissions of greenhouse gases. Hence, many studies have been carried out to develop highly efficient materials for capturing CO₂. Herein, the CO₂ capture performance of mesoporous ceria nanoparticle (MCN) was described. The MCN was synthesized under mild conditions through a sol-gel method using hexadecyltrimethylammonium bromide (CTAB) as a surfactant and further undergone a calcination process at 673 K for 3 h. The prepared MCN possess high surface area (76.0 m² g⁻¹) which is around 9-fold higher than that of commercial CeO₂ (8.7 m² g⁻¹), indicating that the organic modification using CTAB is an effective way of preparing a porous structure. The MCN exhibited high CO₂ uptake of 213.8 μmol g⁻¹ at 298 K and 1 bar. The prepared MCN using sol gel has shown a rapid and cost-effective method compared to the hydrothermal method.

KEYWORDS

Dual solutions; Magnetohydrodynamic; Nanofluid; Stability analysis; Viscous dissipation

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