Synthesis of clamshell derived Ca(OH)2 nano-particles via simple surfactant-hydration treatment

ABSTRACT

Recently, calcium hydroxide (Ca(OH)2) nanoparticles derived from calcium oxide (CaO) has been getting attention from researchers as heterogeneous catalyst for several chemical reaction such as: transesterification, chemisorbents for toxic gases and cracking-decarboxylation process. Ca(OH)2 in nano-crystal structures exhibit superior characteristics which enhance the reaction. In Malaysia, clam species (Meretrix meretrix) are abundantly available in backwater and estuaries along the coast. It is a green material that composed of at least 95% of calcium for CaO production. In the present study, a green solid base Ca(OH)2 nanoparticles was prepared using waste clamshell (M. meretrix) via low cost wet-chemical route. The effects of wet-surfactant treatments (ethylene glycol (EG), diethyl ether (DE) and N-Cetyl-N,N,N-trimethylammonium bromide (CTAB)) on clamshell derived CaO (CS-CaO) were examined. Furthermore, the physicochemical properties of CS-CaO and surfactant treated Ca(OH)2 were analyzed using X-ray fluorescence spectrometer (XRF), X-ray diffraction spectroscopy (XRD), fourier transform spectroscopy (FT-IR), Brunauer–Emmett–Teller (BET) technique, temperature program desorption of carbon dioxide (TPD-CO2), scanning electron microscope (SEM) and transmission electron microscopy (TEM). The results showed that surfactant treatments are capable of enhancing properties of clamshell derived nano-Ca(OH)2 materials such as particle sizes, surface area and basicity. Among the surfactants, EG rendered the most significant effect on the clamshell-derived material, with surface area of 78.38 m2 g−1, basicity of 4658.8 μmol/g and nanoparticle sizes at 25–42 nm.

Keyword: Clamshell; Catalyst; Calcium hydroxide; Surfactant; Nanoparticles