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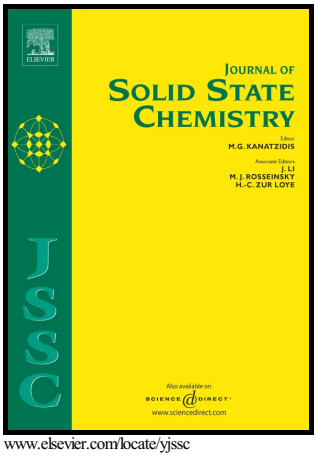

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Synthesis of Calcium Carbonate in Alkali Solution based on Graphene Oxide and Reduced Graphene Oxide

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Abstract

This paper reports a new approach of producing $CaCO_3$ particles in alkali solution. $CaCO_3$ particles with pure calcite structure were obtained from the reaction of water-dispersed graphene oxide (GO) or reduced graphene oxide (rGO) with either $Ca(OH)_2$ or CaO. In Fourier Transform Infrared (FTIR) spectra, the pure calcite structure was demonstrated by fundamental bands at 1425 **(**ν3), 873 (ν2), and 712 cm^{-1} (ν4). The Raman spectra showed the characteristic peak of calcite structure at 1085 cm^{-1} (ν1). X-ray diffraction pattern (XRD) and X-ray photoelectron spectroscopy (XPS) analyses further confirmed that only the pure calcite phase of $CaCO_3$ was formed in both synthesis approaches. Scanning electron microscopy (SEM), Energy dispersive X-ray analyzer (EDX), and High-resolution transmission electron microscopy (HRTEM) also confirmed that distorted cubic and rhombic calcite particles were obtained with GO, while the pine flower-like and flower-like particles were obtained with rGO, and the average crystallite sizes varied from 26–44 nm. The mechanism of the reaction was investigated and it was found that the decomposition of oxygen functional groups on the surface of GO or rGO in certain alkaline media to release CO, CO_2, and