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Synthesis and Characterization of Calcium oxide/ 4A Zeolite composite for Reduction of Vehicle Exhaust Emissions

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The oxides of carbon and nitrogen gases emitted from vehicles in significant quantities pollute the environment to a great extent. The present work focuses on developing a nanocomposite through combining 4A zeolite with calcium oxide (CaO) for reducing air pollution from the vehicular exhaust. The 4A Zeolite/CaO nanocomposite was synthesized by heat treatment of commercially available 4A zeolite with CaO nanoparticles previously prepared by thermal decomposition of egg shells. 4A Zeolite/CaO composite was separated as the top layer and by precipitation from the solution, and both composites were investigated. The materials were characterized by X-ray diffraction (XRD) Fourier transform infrared spectroscopy (FTIR), and scanning electron microscope (SEM) techniques.

The XRD confirmed the successful formation of Cubic CaO. The XRD of both floated and precipitated composites showed the presence of peaks corresponds to both CaO and 4A zeolite and the crystal type is revealed as monoclinic and orthorhombic, respectively. The FTIR spectrum of CaO shows the presence of Ca-O bond and the corresponding spectrum of 4A Zeolite shows the presence of –Si-O and Si-O-Al bonds. FTIR spectra of the composite shows peaks relevant to both zeolite and CaO at wavelength range from 655.778 cm^{-1} to 1448.5 cm^{-1}. The potential application of 4A Zeolite/CaO nanocomposite for purification of vehicle gas exhaust is under investigation.

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