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SYNTHESIS AND CHARACTERIZATION OF CALCIUM OXIDE/ 4A ZEOLITE COMPOSITE FOR EFFICIENT VEHICLE EXHAUST ADSORPTION

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Vehicle emissions cause serious damage to the environment. Adsorption of the emissions is the usual technique being used for remediation. The present work focuses on developing a composite using 4A Zeolite and Calcium oxide (CaO) for effective adsorption of vehicle emissions. The characteristics of the composite under different temperature and compositions have been investigated. Two different composites were prepared, top layer and precipitate, by mixing 4A Zeolite and CaO in appropriate composition. Alumina cement was used as the thermally stable binding material to coat synthesized composite on the metallic surface in order to gas analysis test. Both the top layer and the precipitate of the composite mixture were dried and annealed at different temperatures such as 120˚C, 450˚C, 550˚C, 650˚C, and investigated properties using X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and scanning electron microscope (SEM) techniques. The optimum temperature was revealed for the adsorption of vehicle exhaust emissions through the thermal treatment of the composite. The XRD analysis reveals a phase change in both top and precipitate of the composite. Upon increasing the temperature, Under XRD analysis a new peak at 37.4˚ was observed in the precipitate composite. meanwhile; several other XRD peaks were disappeared in both top and precipitate composites. The FTIR spectra of the composite shows characteristic peaks to both 4A zeolite and CaO at wavelength range from 715 cm^{-1} to 1450 cm^{-1}. When the temperature was increased, the intensity of peak at 1415 $cm^{-1}$was gradually disappeared. It is clearly revealed that the adsorption capacity of the both top and precipitate layers of 4A zeolite/CaO composite extend up to 650ºC from 120ºC. Several broad peaks were observed at high temperatures in the wave length range from 875 cm^{-1} to 900 cm^{-1} in both top and precipitate layers. The SEM images revealed the morphology changes of composites prepared using both top and precipitate upon increasing the temperature. In this study emphasizes the optimum temperature of the composite which can be used for adsorption of vehicle exhaust emissions. The potential application of the optimum temperature of 4A Zeolite/CaO composite for purification of vehicle gas exhaust is under investigated.

Keywords 4A Zeolite, Calcium oxide, vehicle exhaust emissions

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