

Preparation and Characterization of Pure and Na₂O Doped Co₃O₄ Spinel Supported Catalyst for Photocatalytic Degradation of Reactive Yellow Dye 145

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Abstract : The co-catalysts Co₃O₄-MgO and Co₃O₄-CaO spinel supported catalyst were prepared by the co-precipitation method in different ratios. The Na₂O doped Co₃O₄-MgO catalyst was prepared using wet impregnation method by addition weight of sodium nitrate corresponding to the desired percentage (0.5, 1.0 and 1.5 %) of Na₂O to bicarbonates catalyst. The pure and doped bicarbonates of catalysts were calcinated at 600 °C for 4 hrs. The pure and Na₂O doped catalysts were characterized by using Fourier transform infrared spectroscopy (FTIR), X-rays diffraction (XRD) and atomic force microscopy (AFM) techniques. In addition to that, band gap energy of these materials were estimated using the UV-visible spectrophotometer. Physical properties of these catalysts were investigated by wet impregnation method. The 0.5 %Na₂O-30Co₃O₄-70MgO catalyst has a best physical properties, therefore it showed high activity for photocatalytic degradation of reactive yellow dye 145. Different reaction conditions were performed such as pH of reaction mixture, weight of catalysts and the effect of temperature. Activation energy for the prepared catalysts was investigated and it was equal to 16 kJ. mol⁻¹ and 22 kJ. mol⁻¹ for Na₂O doped and pure 30Co₃O₄-70MgO catalysts respectively. The photocatalytic activity of these materials was investigated by following photocatalytic removal of reactive yellow dye from its aqueous solution using UV-visible spectrophotometer. The absorbance of supernatant liquid was recorded at 416 nm.

Key words: spinel catalyst, Na₂O doped spinel catalyst, Na₂O-Co₃O₄-MgO.

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