SYNTHESIS AND CHARACTERIZATION OF $Ca_xCo_{1-x}TiO_3$ AND ITS PHOTOCATALYTIC ACTIVITY ON METHYLENE BLUE PHOTODEGRADATION

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A series of $Ca_xCo_{1-x}TiO_3$ has been prepared through the ceramic method as polycrystalline powders with x = 0, 0.01, 0.025, 0.05, and 0.1. The structure of resulting materials was refined from a powder X-ray diffraction using the Rietveld method showing the perovskite-type structure isostructural with $CaTiO_3$. The morphology and particle size of $Ca_xCo_{1-x}TiO_3$ were studied using SEM/EDX that showed a particle size of around 3.5 nm with non-homogenous particle sphere shapes. The materials' electronic structure was studied by using UV/Vis spectroscopy method, which showed that the prepared $Ca_xCo_{1-x}TiO_3$ having good response in the visible region with the band gap energy (E_g) of around 2.2 eV, which is highly potent as visible light photocatalysts. The adsorption capacity and adsorption equilibrium constant of the oxides to the methylene blue were also studied. The adsorption process in $Ca_xCo_{1-x}TiO_3$ materials follows the Langmuir adsorption type as a consequence of homogenous pore structures. The catalytic activity of $Ca_xCo_{1-x}TiO_3$ on the methylene blue degradation are also discussed.

Keywords : $Ca_xCo_{1-x}TiO_3$, perovskite structure, visible-light photocatalyst

Introduction

The perovskite structure compound, ABO_3, and its derivatives are widely investigated due to their significance in both fundamental research and the high potential applications because of their diverse physical properties (Cohen, 1992; Hu *et al.*, 2016, Kanhere, *et al.*, 2014). The $MTiO_3$ perovskite (where M is Ca, Sr or Ba) is one of the most attracting materials since it has a unique electronic structure, and so it is developed for solar applications, such as photo-electrochemical cells, solar cells, and photovoltaic technologies (Shi *et al.*, 2012). The compounds are modified by