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Photocatalytic Activity of the Binary Composite CeO2/SiO2 for Degradation of Dye

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In this study, CeO2photocatalyst was modified by composite with SiO2 to increase efficiency and improve photocatalytic activity. The as-prepared SiO2 particles have been incorporated into the precursor mixture of CeO2 by homogeneous precipitation and subsequent calcination process. The phase compositions of CeO2 before and after compositing with SiO2 were identified by X-ray diffraction (XRD). The morphology and particle size of CeO2/SiO2 composite was analyzed by high resolution transmission electron microscopy (HRTEM) and field emission scanning electron microscopy (FESEM). The results showed SiO2 spheres with the particle size approximately 100–120 nm, and a uniform layer of CeO2 nanoparticles with a diameter of about 5–7 nm that were fully composite to the surfaces of SiO2. The X-ray photoelectron spectroscopy (XPS) technique was carried out in order to characterize the change in valence state and composite characteristic by shifted peaks of binding energies. The photocatalytic activity was studied through the degradation of Rhodamine B in aqueous solution under visible light exposure. The highest photocatalytic efficiency of CeO2/SiO2 composite was also obtained. To explain the high photocatalytic efficiency of CeO2/SiO2 composite, the proposed mechanism involves the high surface properties of the CeO2/SiO2 composite, as measured by Brunauer–Emmett–Teller (BET) method.

Keywords: Composite materials, CeO2, Rhodamine B, Silica, Photocatalysis

Primary author: Dr PHANICHPHANT, Sukon (Materials Science Research Center, Faculty of Science, Chiang Mai University)

Presenter: Dr PHANICHPHANT, Sukon (Materials Science Research Center, Faculty of Science, Chiang Mai University)

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