
Novel Visible Light-Driven Photocatalyst of Mesoporous TUD-1 Supported Chromium Oxide Doped Titania for Phenol Photodegradation

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ABSTRACT

Novel visible light driven mesoporous photocatalysts of Technische Universiteit Delft-1 (TUD-1) supported 1 mol% Cr oxide doped TiO₂ (Cr-TiO₂) were synthesized. Low angle XRD and FTIR results confirmed the amorphous and mesoporous silicate framework of TUD-1 in the materials. The mesostructure was further confirmed via N₂ adsorption-desorption analysis showing type IV isotherm with narrow average pore size distribution (2.5 nm) and high surface area (864 m²/g). TEM analysis results indicated the attainment of nanoparticles and the porous channels in the synthesized materials. An increase in band-gap energy was observed after loading of Cr-TiO₂ into TUD-1. As compared to the unsupported Cr-doped TiO₂, all the TUD-1 supported Cr-doped TiO₂ photocatalysts showed higher photocatalytic activity for phenol degradation under visible light irradiation. Amongst, sample Cr oxide doped TiO₂ supported on TUD-1 with molar ratio Si/Ti = 30 exhibited the highest photodegradation of phenol (82%). The phenol photodegradation followed the Langmuir adsorption isotherm with first order kinetics.

| Phenol | Mesoporous silica | TUD-1 | Adsorption | Photocatalyst |

Novel Oxidative-Acidic Bifunctional Catalyst of Tungsten-Phosphate Modified Silica-Titania

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ABSTRACT

A novel oxidative-acidic bifunctional catalyst of tungsten-phosphate supported silica-titania was successfully synthesized and characterized. Different tungsten amount was impregnated into silica-titania followed by phosphoric acid treatment via sol gel method. The impregnation of WO₃ and PO₄³⁻ into TiO₂-SiO₂ followed by drying and calcination gave the greyish colour to the samples. X-ray diffractograms of the samples showed the structures of TiO₂-SiO₂ remained as amorphous structure after loading of WO₃ and PO₄³⁻. The catalytic performance of the samples of PO₄³⁻/xW/TiO₂-SiO₂, (x = 1- 5wt %) as bifunctional catalyst in the formation of 1,2-octanediol through conversion of 1-octene to of 1,2-epoxyoctane using aqueous H₂O₂ as an oxidant was evaluated. It has been demonstrated that PO₄³⁻/5W/TiO₂-SiO₂ was an active bifunctional oxidative-acidic catalyst in producing 1,2-octanediol from 1-octene.

| Bifunctional catalyst | Oxidative | Brønsted acidity | Tungsten oxide | Phosphoric acid |
