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 TiO_2 (Cr-TiO_2) 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 N_2 adsorption-desorption analysis showing type IV isotherm with narrow average pore size distribution (2.5 nm) and high surface area (864 m^2/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-TiO_2 into TUD-1. As compared to the unsupported Cr-doped TiO_2, all the TUD-1 supported Cr-doped TiO_2 photocatalysts showed higher photocatalytic activity for phenol degradation under visible light irradiation. Amongst, sample Cr oxide doped TiO_2 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 WO_3 and PO_4^{3-} into TiO_2-SiO_2 followed by drying and calcination gave the greyish colour to the samples. X-ray diffractograms of the samples showed the structures of TiO_2-SiO_2 remained as amorphous structure after loading of WO_3 and PO_4^{3-}. The catalytic performance of the samples of PO_4^{3-}/xW/TiO_2-SiO_2, (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 H_2O_2 as an oxidant was evaluated. It has been demonstrated that PO_4^{3-}/5W/TiO_2-SiO_2 was an active bifunctional oxidative-acidic catalyst in producing 1,2-octanediol from 1-octene.

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