



Adsorption and Photocatalytic degradation of crystal violet dye in the presence of different metals doping on TiO₂

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ABSTRACT

In this work, titanium dioxide particles TiO₂ (Hombikat UV 100) doped with 0.5 % of Pt, Rh and Ru metals. They are prepared by photodeposition method. The bare TiO₂ and prepared samples were characterized by powder X-ray diffraction (XRD), UV-VIS diffuse reflectance spectra (UV-VIS, DRS), nitrogen adsorption BET, and atomic force microscopy (AFM). XRD data shows that the most particles with a size less than 10 nm. While AFM shows most particles with a size more than (55-65 nm). The band gap energy values for bare TiO₂, Pt/TiO₂, Pd/TiO₂, Rh/TiO₂ and Ru/TiO₂ were calculated by using the Kubelka-Munk model. The results show that, the band gap values were decreased with metalized TiO₂ and obtained a red shift. This in agreement with the values decreasing of crystallite size, average diameter (particle size) and surface area. The adsorption and photocatalytic degradation of CV dye over bare TiO₂, Pt/TiO₂, Pd/TiO₂, Rh/TiO₂ and Ru/TiO₂, has been studied. The addition of Pd or Pt dramatically increases the adsorption and photocatalytic degradation of CV dye. On the contrary, the Rh doped TiO₂ is far less active, while Ru doped TiO₂ decrease the photocatalytic activity of CV. It was found that the photocatalytic degradation activity of crystal violet showed the following trend: Pt/TiO₂ ≈ Pd/TiO₂ > Rh/TiO₂ > TiO₂ > Ru/TiO₂.

Keywords: Adsorption, Photocatalytic degradation, TiO₂, Pt/TiO₂, Pd/TiO₂, Rh/TiO₂, Ru/TiO₂.
