Visible light responsive ruthenium-doped titanium dioxide for the removal of metsulfuron-methyl herbcide in aqueous phase

Senthilnanthan, M., Ho, D.P., Vigneswaran, S., Ngo, H.H. And Shon, H.K.

Abstract

Titanium dioxide (TiO2) under UV light irradiation is one of the effective treatment methods to reduce the concentration of synthetic organic compounds in water. Nevertheless, only a small amount of UV light is absorbed in the solar light. This makes the less use of TiO2 for environmental applications. In this study, we prepared Ru-doped visible light responsive (VLR) TiO2 to improve visible light absorption and characterized it in terms of physical and chemical properties. The photocatalytic activity of VLR Ru-doped TiO2 was investigated to remove metsulfuron-methyl (MSM) in aqueous phase. The Ru-doped TiO2 at different Ru concentrations was found to have the anatase phase. The undoped and Ru-doped TiO2 consisted of regular round shape. The photocatalytic activity of VLR photocatalyst was significantly improved on the addition of Ru from 40% for undoped TiO2 to 80% for Ru-doped TiO2. The removal efficiency of MSM was proportional to the increasing Ru-doped TiO2 under visible light. As the calcined temperature increased from 300 to 900 °C, the degradation efficiencies moderately changed from 65 to 90%. However, the effect of calcination duration was marginal on the photodegradation of MSM.