OA24

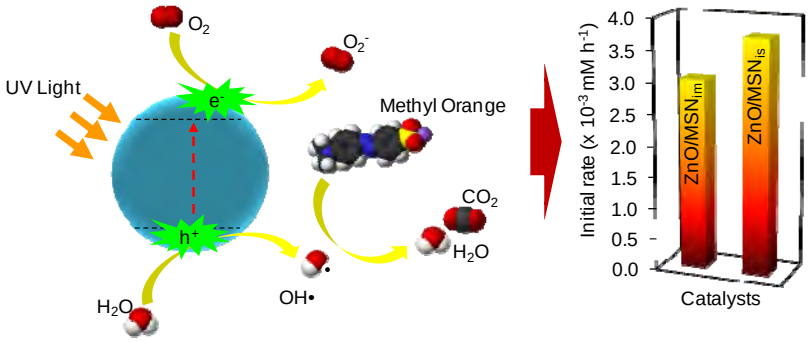
Effect of Synthesis Method on The Photocatalytic Performance of Zinc Oxide Loaded on Mesostructured Silica Nanoparticles

Nurfatehah Wahyuny Che Jusoh[1], Aishah Abdul Jalil[1,2*] and Sugeng Triwahyono[3,4]

[1]Department of Chemical Engineering, Faculty of Chemical Engineering,
[2]Institute of Hydrogen Economy, Faculty of Chemical Engineering,
[3]Department of Chemistry, Faculty of Science,
[4]Ibnu Sina Institute for Fundamental Science Studies,
Universiti Teknologi Malaysia, 81300 Johor Bahru, Johor.

**Corresponding author: aishah@cheme.utm.my*

An advanced oxidation process (AOPs) using heterogeneous semiconductor photocatalysts such as TiO_2, Fe_2O_3, ZnO, CuO, and ZrO_2 have become a popular method for the removal of toxic pollutants from wastewater[1,2]. Among them, ZnO has been widely researched in photocatalytic applications due to its activity which is comparable to TiO_2. Recently, the incorporation of ZnO into a mesoporous material support has been discussed by several research groups[3,4]. It is believed that the incorporation of both materials is a beneficial approach to improve the photocatalytic activity of the catalyst[5,6]. Therefore, in this study, two approaches have been introduced to prepare a zinc oxide loaded on mesostructured silica nanoparticles (ZnO/MSN) catalyst; in-situ (ZnO/MSN_{is}) and impregnation (ZnO/MSN_{im}). The effect of the preparation methods on the properties of both catalyst were studied via XRD and FTIR analysis. The introduction of zinc species onto silica framework was found to form an interaction between the host and support material. The desilication occurred in the silica framework of the MSN accompanied by isomorphous substitution of Zn^{2+}cations to form an active species Zn–O–Si bond. The photocatalytic activity of both ZnO/MSNs were tested on photodecolorization of methyl orange (MO). The ZnO/MSN_{is} showed the highest decolorization rate at an optimum dosage of 1 g L^{-1} using 3.06 × 10^{-2} mM MO after 8 h at pH 2 under UV irradiation. A kinetic study demonstrated that the photocatalytic reaction followed the pseudo first-order model.



Scheme 1 Photodecolorization of Methyl Orange

1. J.H. Sun, S.Y. Dong, Y.K. Wang, S.P. Sun, J. Hazard. Mater. 2009, 172, 1520–1526.
2. R. Wahab, I.H. Hwang, Y.-S. Kim, H.-S. Shin, Chem. Eng. J. 2011, 168, 359–366
3. C. Bouvy, F. Piret, W. Marine, B.L. Su, Chem. Phys. Lett. 2007, 433, 350–354.
4. H. Sun, X. Feng, S. Wang, H.M. Ang, M.O. Tadé, Chem. Eng. J. 2011, 170, 270–277.
5. N.W.C. Jusoh, A.A. Jalil, S. Triwahyono, H.D. Setiabudi, N. Sapawe, M.A.H. Satar, A.H. Karim, N.H.N. Kamarudin, R. Jusoh, N.F. Jaafar, N. Salamun, J. Efendi, Appl Catal, A: Gen. 2013, 468, 276-287.
6. N. Sapawe, A.A. Jalil, S. Triwahyono, S.H. Adam, N.F. Jaafar, M.A.H. Satar, Appl. Catal., B: Environ. 2012, 125, 311–323

Ms. Nurfatehah Wahyuny binti Che Jusoh
Universiti Teknologi Malaysia, UTM Johor Bahru, Johor, Malaysia.
Phone: +6013 9981990
E-mail: wahyunyche@gmail.com
Research interests : Photocatalytic, Mesoporous silica, Adsorption

2007-2011	B.Eng.(Chemical Engineering), UTM, Malaysia
2011-present	PhD (Chemical Engineering), UTM, Malaysia