Photocatalysts and Photochemical Reduction Process in Predicting Growth of Gold Nanoparticle Associated With Mathematical Modelling

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ABSTRACT

Nowadays, to develop new generation of nanodevices, most researchers such as chemists, physicists, biologists, even the engineers are focussing their studies towards the uniqueness as well as the chemical properties of metal nanoparticles. Even, the mathematician also has govern the appropriate mathematical modelling regarding of properties of nanoparticles such as gold nanoparticles. In this paper, some experiment regarding the photochemical and photocatalytic processes for predicting the growth of gold nanoparticles from previous studies has been reviewed. Besides that, in observing the growth rate of gold nanoparticles, a mathematical modelling has been governed. Where, ultraviolet, UV radiation with wavelength of 366 nm and 253.7 nm has been fixed as the constant parameters. The governing equation is then solved numerically using some iterative method known as Jacobi and Gauss Seidel. The convergence of both methods are discussed detailed and the numerical analysis are presented in table form to justify and validate the convergence as well as the performance of the proposed iterative methods.

| Photochemical | Parabolic PDE | Gold nanoparticles | Photocatalysts | Mathematical model | Finite different method (FDM) |

Iron (III) Porphyrin Biomimetic Catalyst Supported on Ionic Liquid Modified SBA-15 for Epoxidation of 1-Octene

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ABSTRACT

Ionic liquids (ILs) have attracted much attention as an alternative reaction media to conventional organic solvents due to their unique physicochemical properties especially their low vapor pressure which can be considered as non-volatile compound. Furthermore, it has been shown that ILs provided more suitable environment for enzymes, making it a suitable candidate as green catalysts for biotransformation. Synthetic metalloporphyrins have been used as functional molecules and mimic of enzyme like catalase, peroxidases and cytochrome P-450. However, there is lack of report on the synthesis of metalloporphyrins supported ILs because of reduction of mass transfer ability from their toxicity and high viscosity. In this study, the metalloporphyrin, iron(III)-5,10,15,20-tetra-(4-pyridyl)porphyrin (FeTPyP) which able to mimic the reactions mediated by cytochrome P450 enzyme, was synthesized from the reaction of free-base porphyrin, 5,10,15,20-tetra-(4-pyridyl)porphyrin (TPyP) with iron(III) chloride hexahydrate. Ionic liquid grafted mesoporous silica SBA-15 (IL-SBA-15) was prepared through functionalization of ionic liquid 1-(3-triethoxysilylpropyl)-3-methylimidazolium chloride (IMI^+Cl^-) onto the surface hydroxyl of mesoporous silica SBA-15. FeTPyP acts as a homogeneous catalyst was then immobilized onto IL-SBA-15 to afford a heterogeneous catalyst, FeP-IL-SBA. The catalytic activity of the heterogeneous catalysts was tested in the epoxidation of 1-octene and the reaction was carried out in acetone using tert-Butyl hydroperoxide (TBHP) as oxidant at 70 °C for 24 hours. It was found that 1,2-epoxyoctane was the main product and were analyzed using GC-FID and GC-MS.

| Ionic liquid | Metalloporphyrin | SBA-15 | Epoxidation | Octene |