ABSTRAK

Peluang untuk mengoptimalkan eliminasi polutan organik melalui fotokatalis BiSI dibawah sinar tampak sangat menjanjikan karena memiliki energi celeh pita kecil. Penelitian ini bertujuan untuk mensintesis nanokomposit BiSI/PANI menggunakan metode polimerisasi kimia dan mengevaluasi aktivitas fotokatalitiknya terhadap degradasi *methylene blue*. BiSI disintesis melalui metode hidrotermal/solvotermal dengan variasi pelarut yang terdiri atas etanol, air, dan isopropanol. BiSI dengan struktur paling murni digunakan untuk sintesis nanokomposit BiSI/PANI. Nanokomposit BiSI/PANI didesain melalui polimerisasi anilin menggunakan ammonium persulfat sebagai agen pengoksidasi dalam medium asam. Karakterisasi material dilakukan dengan XRD, SEM, UV-Vis DRS, dan FTIR. Aktivitas fotokatalitik diuji menggunakan LED biru dan merah. Hasil karakterisasi menunjukan bahwa BiSI dengan struktur murni didapatkan melalui pelarut isopropanol. Nanokomposit BiSI/PANI berhasil disintesis dengan celah pita 1,37 eV. Material BiSI maupun komposit BiSI/PANI memiliki kemampuan degradasi lebih tinggi ketika disinari dengan cahaya merah dibandingkan dengan cahaya biru. Desain nanokomposit BiSI/PANI tidak dapat memberikan peningkatan aktivitas fotokatalitik. PANI memberikan efek penurunan aktivitas pada BiSI.

Kata kunci: BiSI, fotokatalis, hidrotermal, *methylene blue*, nanokomposit, polimerisasi kimia, PANI, solvotermal.

ABSTRACT

The opportunity to optimise the elimination of organic pollutants through BiSI photocatalysts under visible light is very promising because they have small band gap energy. This study aims to synthesise BiSI/PANI nanocomposites using chemical polymerisation methods and evaluate their photocatalytic activity towards methylene blue degradation. BiSI was synthesised via the hydrothermal/solvothermal method with varying solvents, including etanol, water, and isopropanol. BiSI with the purest structure was used for the synthesis of BiSI/PANI nanocomposites. The BiSI/PANI nanocomposites were designed through aniline polymerisation using ammonium persulphate as an oxidising agent in an acidic medium. Material characterisation was performed using XRD, SEM, UV-Vis DRS, and FTIR. Photocatalytic activity was tested using blue and red LEDs. Characterisation results showed that BiSI with a pure structure was obtained using isopropanol as the solvent. The BiSI/PANI nanocomposite was successfully synthesised with a bandgap of 1.37 eV. Both BiSI and BiSI/PANI composite materials exhibit higher degradation efficiency when exposed to red light compared to blue light. The design of the BiSI/PANI nanocomposite does not enhance photocatalytic activity. PANI reduces the activity of BiSI.

***Keywords**: BiSI, chemical polymerization, hydrothermal, methylene blue, nanocomposite, PANI, photocatalyst, solvothermal.*