

Sintesis nanokomposit ZnO/SmMnO₃ dengan ekstrak daun pulai (alstonia scholaris) dalam sistem dua fasa (heksana-air) untuk fotodegradasi malasit hijau = Synthesis of ZnO/SmMnO₃ nanocomposite with pulai leaves extract (alstonia scholaris) in two-phase system (hexane-water) for malachite green photodegradation

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Abstrak

ABSTRACT

Pada penelitian ini, sintesis nanopartikel ZnO, nanopartikel SmMnO₃, dan nanokomposit ZnO/SmMnO₃ secara green synthesis berhasil dilakukan menggunakan ekstrak daun pulai (*Alstonia scholaris*). Sintesis nanopartikel dan nanokomposit dilakukan dalam sistem dua fasa dengan menggunakan metode pengadukan kecepatan tinggi. Hasil sintesis selanjutnya dikarakterisasi menggunakan instrumentasi spektrofotometer UV-Vis, spektrofotometer UV-Vis DRS, spektroskopi FTIR, XRD, PSA, SEM-EDX, dan TEM. Hasil karakterisasi XRD nanokomposit ZnO/SmMnO₃ menunjukkan nilai difraksi 2 θ , khas gabungan nanopartikel ZnO dan nanopartikel SmMnO₃. Nanokomposit ZnO/SmMnO₃ yang dikarakterisasi dengan TEM memiliki ukuran partikel sebesar 57,73 nm dengan distribusi ukuran rata-rata yang dikarakterisasi dengan PSA sebesar 86,57 nm dalam rentang 58,77-141,8 nm. Nanokomposit ZnO/SmMnO₃ menunjukkan aktivitas fotodegradasi terhadap malasit hijau lebih baik daripada nanopartikel ZnO dan nanopartikel SmMnO₃ dibawah sinar tampak selama 2 jam penyinaran. Presentase degradasi dengan nanokomposit ZnO/SmMnO₃, nanopartikel ZnO, dan nanopartikel SmMnO₃ sebesar 91,47%, 73,61%, dan 73,47%. Perhitungan kinetika reaksi fotodegradasi malasit hijau didapatkan bahwa nanokomposit ZnO/SmMnO₃ mengikuti reaksi semu orde satu.

ABSTRACT

In this study, the synthesis of ZnO nanoparticles, SmMnO₃ nanoparticles, and ZnO / SmMnO₃ nanocomposites were successfully carried out using pulai leaves extract (*Alstonia scholaris*). Nanoparticles and nanocomposite synthesis were carried out in two-phase system which occupying the high speed stirring method. The synthesis results were then characterized using UV-Vis spectrophotometer, DRS UV-Vis, FTIR, XRD, PSA, SEM-EDX, and TEM. The results of XRD characterization of ZnO/SmMnO₃ nanocomposite showed a typical diffraction of 2 θ , value of the combination ZnO nanoparticles and SmMnO₃ nanoparticles. ZnO/SmMnO₃ nanocomposite characterized by TEM has a particle size of 57,73 nm with an average size distribution characterized by PSA of 86,57 nm in the range 58,77-141,8 nm. ZnO/SmMnO₃ nanocomposites showed better photodegradation activity on malachite green than ZnO nanoparticles and SmMnO₃ nanoparticles under irradiation visible light for 2 hours . The percentage of degradation with ZnO/SmMnO₃ nanocomposites, ZnO nanoparticles, and SmMnO₃ nanoparticles was 91.47%, 73.61%, and 73.47% respectively. The calculation of the photodegradation reaction of malachite green kinetics found that ZnO/SmMnO₃ nanocomposites comply a pseudo first-order reaction.