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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 2I¸ 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.
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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 2I¸ 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.