

Green Synthesis Nanokomposit ZnO/Ce₂Sn₂O₇ Menggunakan Ekstrak Daun Kirinyuh (*Chromolaena odorata* L.) dan Aktivitas Fotokatalitiknya terhadap Degradasi Rifampicin = Green Synthesis of ZnO/Ce₂Sn₂O₇ Nanocomposites Using Siam Weed (*Chromolaena odorata* L.) Leaf Extract and its Photocatalytic Activity against Rifampicin Degradation

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Abstrak

Pada penelitian ini, sintesis nanopartikel ZnO, nanopartikel Ce₂Sn₂O₇, dan nanokomposit ZnO/Ce₂Sn₂O₇ berhasil dilakukan dengan metode green synthesis menggunakan ekstrak daun kirinyuh (*Chromolaena odorata* L.). Kandungan metabolit sekunder pada daun kirinyuh seperti alkaloid dan saponin dimanfaatkan sebagai basa lemah dan capping agent dalam proses sintesis. Karakterisasi FTIR, XRD, UV-Vis DRS, dan FESEM-EDX dilakukan untuk mengetahui sifat struktural, optik, maupun morfologi dari nanopartikel dan nanokomposit yang dihasilkan. Berdasarkan hasil karakterisasi menggunakan UV-Vis DRS, diperoleh nilai energi band gap dari nanopartikel ZnO, nanopartikel Ce₂Sn₂O₇, dan nanokomposit ZnO/Ce₂Sn₂O₇ masing-masing sebesar 3,00 eV; 2,41 eV; dan 2,52 eV. Selain itu, hasil uji fotokatalitik menunjukkan bahwa nanokomposit ZnO/Ce₂Sn₂O₇ memiliki aktivitas fotokatalitik yang paling baik dibandingkan nanopartikel ZnO dan Ce₂Sn₂O₇ dalam mendegradasi rifampicin di bawah sinar tampak selama 120 menit. Persen fotodegradasi rifampicin oleh ZnO/Ce₂Sn₂O₇, Ce₂Sn₂O₇, dan ZnO berturut-turut sebesar 92,25%; 68,57%; dan 55,38%. Lebih lanjut, reaksi fotodegradasi rifampicin menggunakan ZnO/Ce₂Sn₂O₇ mengikuti kinetika laju pseudo orde satu.

.....In this research, synthesis of ZnO nanoparticles, Ce₂Sn₂O₇ nanoparticles, and ZnO/Ce₂Sn₂O₇ nanocomposites were successfully carried out by means of green synthesis method using siam weed (*Chromolaena odorata* L.) leaf extract. The secondary metabolites in siam weed leaf such as alkaloids and saponins were used as weak bases and capping agents in the synthesis process. FTIR, XRD, UV-Vis DRS, and FESEM-EDX measurements were conducted to elucidate the structural, optical, and morphological properties of nanoparticles and nanocomposites. Based on the results of characterization using UV-Vis DRS, the band gap energy values of ZnO nanoparticles, Ce₂Sn₂O₇ nanoparticles, and ZnO/Ce₂Sn₂O₇ nanocomposites were 3.00 eV, 2.41 eV, and 2.52 eV. In addition, the photocatalytic test results showed that ZnO/Ce₂Sn₂O₇ nanocomposites had the best photocatalytic activity compared to ZnO and Ce₂Sn₂O₇ nanoparticles against rifampicin under visible light for 120 minutes. Rifampicin photodegradation percentage by ZnO/Ce₂Sn₂O₇, Ce₂Sn₂O₇, and ZnO obtained were 92.25%, 68.57%, dan 55.38%, respectively. Additionally, the reaction kinetics of rifampicin photodegradation using ZnO/Ce₂Sn₂O₇ was found to be a pseudo-first-order rate.