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

Franzeska Rosariz Wijaya, author

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.