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CuO-Gd2Ti2O7 yang Disintesis dalam Sistem Dua Fasa Menggunakan Ekstrak Daun Jotang Kecil (Acmella uliginosa) serta Kinerja Fotokatalitiknya dalam Sinar Tampak = CuO-Gd2Ti2O7 Prepared by Two-Phase System using Acmella Uliginosa and Its Photocatalytic Performance Under Visible Light

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Abstrak

Sintesis terhadap CuO, Gd2Ti2O7, dan CuO-Gd2Ti2O7 telah berhasil dilakukan dengan menggunakan ekstrak daun jotang kecil (EDJK) dalam sistem dua fasa. Sistem dua fasa berarti sintesis dilakukan pada dua fasa yang berbeda yaitu fase nonpolar (EDJK) dan fase polar (Prekursor). Adanya kandungan metabolit sekunder seperti Alkaloid, saponin, dan steroid dalam EDJK memiliki peranan penting dalam sintesis material. Alkaloid dalam EDJK ini berfungsi sebagai sumber basa lemah dan saponin dan steroid berfungsi sebagai capping agent. Nilai bandgap komposit CuO-Gd2Ti2O7 yang telah berhasil disintesis kemudian adalah sebesar 1.78 eV yang diukur dengan menggunakan UV-Vis DRS. Kinerja Fotokatalitik dari komposit CuO-Gd2Ti2O7 diuji pada fotodegradasi senyawa zat warna malasit hijau (MG) dalam sinar tampak selama 90 menit, dan dibandingkan dengan CuO dan Gd2Ti2O7. Komposit CuO-Gd2Ti2O7 menunjukkan hasil persen degradasi yang paling tinggi yaitu sebesar 75.95% dibandingkan dengan CuO sebesar 66.73% dan Gd2Ti2O7 sebesar 46.73%.

.....CuO-Gd2Ti2O7 has been prepared by a two-phase system, consisting of polar precursor solution and non-polar hexane fraction of Acmella uliginosa leaf extract (AUE). The secondary metabolites in AUE have an important role in the synthesis of CuO-Gd2Ti2O7. In specific, alkaloid acts as the source of a weak base to produce hydroxide ions in the synthesis of the metal oxide. Meanwhile, saponin and terpenoid are used as the capping agent, to stabilize the particle formation of CuO-Gd2Ti2O7. The optical bandgap value for CuO-Gd2Ti2O7 measured by UV-Vis DRS significantly decreased from 3.68 to 1.78 eV compared to Gd2Ti2O7. The photocatalytic activity of CuO-Gd2Ti2O7 was investigated degradation of malachite green (MG) under visible light illumination. As a result, CuO-Gd2Ti2O7 showed the MG degradation percentage of 75.40% after 90 min of illumination time, which is 1.7 times higher than the MG degradation percentage over Gd2Ti2O7. This improved photocatalytic activity is ascribed to the narrower optical bandgap Gd2Ti2O7 after decorated by CuO, which can effectively work in the visible region. This research suggests a novel method to prepare alternative photocatalyst for the degradation of malachite green under visible light illumination.