Sintesis nanokomposit SiO2/NiFe2O4 menggunakan ekstrak daun tahongai (kleinhovia hospita l.) dalam sistem 2 fasa dan uji aktivitas katalitiknya terhadap 4-nitroanilin = Synthesis of SiO2/NiFe2O4 nanocomposite using tahongai (kleinhovia hospita l.) leaf extract in a two-phase system and catalytic activity test on 4-nitroaniline

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Abstrak

Dalam penelitian ini, sintesis hijau nanopartikel SiO2, nanopartikel NiFe2O4, dan nanocomposites SiO2 / NiFe2O4 dalam sistem dua fase (hexane-water) berhasil dilakukan menggunakan ekstrak daun tahongai (Kleinhovia hospita L.). Alkaloid sebagai metabolit sekunder digunakan sebagai sumber basa (-OH), sedangkan saponin digunakan sebagai agen penutup. Sintesis nanopartikel SiO2 yang berhasil, nanopartikel NiFe2O4, dan nanokomposit SiO2 / NiFe2O4 dikonfirmasi melalui hasil karakterisasi. Karakterisasi XRD membuktikan bahwa nanopartikel SiO2 memiliki struktur amorf, nanopartikel NiFe2O4 memiliki struktur spinel kubik, dan nanokomposit SiO2 / NiFe2O4 memiliki nilai difraksi gabungan 2 combined yang khas. Karakterisasi TEM menunjukkan ukuran rata-rata nanokomposit SiO2 / NiFe2O4 sebesar 10 nm. Aktivitas katalitik nanokomposit SiO2 / NiFe2O4 lebih tinggi dari nanopartikel SiO2 dan nanopartikel NiFe2O4 dengan persentase reduksi masing-masing 95,68%, 29,75%, dan 79,79% selama 30 menit. Berdasarkan perhitungan kinetika reaksi reduksi 4-Nitroanilin terhadap p-phenylenediamine menunjukkan bahwa nanokomposit SiO2 / NiFe2O4 mengikuti kinetika orde satu semu.
.....In this research green synthesis of SiO2 nanoparticles, NiFe2O4 nanoparticles, and SiO2 / NiFe2O4 nanocomposites in a 2 phase (hexane-water) system was successfully carried out using a tahongai (Kleinhovia hospita L.) leaf extract. The secondary metabolite compound, the alkaloid, is used as a hydrolyzing agent (base source -OH), while saponin is used as a stabilizing agent (capping agent). The success of synthesis of SiO2 nanoparticles, NiFe2O4 nanoparticles, and SiO2 / NiFe2O4 nanocomposites was confirmed through the results of characterization. XRD characterization proves that SiO2 nanoparticles have an amorphous structure, NiFe2O4 nanoparticles have a cubic spinel structure, and SiO2 / NiFe2O4 nanocomposites have a diffraction value of 2Î¸ typical of the two combined. TEM characterization shows the average size of SiO2 / NiFe2O4 nanocomposites is 10 nm. The catalytic activity test of SiO2 nanoparticles, NiFe2O4 nanoparticles, and SiO2 / NiFe2O4 nanocomposites as reduction catalysts were carried out on 4-Nitroaniline with NaBH4 as a reducing agent. The catalytic activity of SiO2 / NiFe2O4 nanocomposite was higher than SiO2 nanoparticles and NiFe2O4 nanoparticles with reduction percentage of 95.68%, 29.75% and 79.79% for 30 minutes, respectively. Based on the kinetics calculation, the rate of reduction of 4-Nitroaniline to p-phenylendiamine was found that the SiO2 / NiFe2O4 nanocomposite followed the pseudo first order reaction kinetics.