

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 2 θ , 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-phenylenediamine was found that the SiO₂ / NiFe₂O₄ nanocomposite followed the pseudo first order reaction kinetics.