

Reduksi 4-nitrofenol dengan NABH₄ menggunakan katalis nanobimetalik Cu-Ni terimobilisasi dalam zeolit alam = Reduction of 4-nitrophenol with NABH₄ using nanobimetallic catalysts Cu-Ni immobilized in nature zeolite

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Abstrak

[ABSTRAK

Modifikasi permukaan suatu material saat ini sangat menarik untuk diamati. Pada penelitian ini, dilakukan modifikasi terhadap zeolit alam Indonesia dengan nanobimetalik Cu dan Ni untuk katalis reduksi 4-nitrofenol. Nanobimetalik berhasil diimmobilisasi ke dalam zeolit alam dengan mereduksi Cu²⁺ dan Ni²⁺ dengan NaBH₄. Katalis yang disintesis (zeolit@Ni, zeolit@Cu, zeolit@Cu@Ni, zeolit@Cu-Ni, dan zeolit@Ni@Cu) dapat membantu menurunkan absorbansi spektrofotometer UV-Vis intermediat 4-nitrofenolat. Didapatkan hasil penelitian dengan urutan aktivitas katalis 75 mg zeolit@Ni@Cu > 100 mg zeolit@Cu-Ni > 75 mg zeolit@Cu@Ni > 75 mg zeolit@Cu untuk mereduksi 4-nitrofenol dengan konsentrasi 8,60x10⁻⁵ M, sedangkan zeolit@Ni tidak dapat mereduksi. Didapatkan juga nilai tetapan laju reaksi sejati (k) untuk masing-masing katalis. Untuk zeolit@Cu k= 0,0814 menit⁻¹, zeolit@Cu@Ni k= 0,26 menit⁻¹, zeolit@Cu-Ni k= 0,118 menit⁻¹, dan zeolit@Ni@Cu k=0,213 menit⁻¹.

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ABSTRACT

Surface modification of a material is very interesting to observe. In this research, modification of Indonesian nature zeolite with bimetallic nanoparticle Cu and Ni has done for the catalytic reduction of 4-nitrophenol. Bimetallic nanoparticles have been successfully immobilized into natural zeolite after reducing the immobilized Cu²⁺ and Ni²⁺ with NaBH₄. The synthesized catalysts (zeolit@Ni, zeolit@Cu, zeolit@Cu@Ni, zeolit@Cu-Ni, and zeolit@Ni@Cu) could decreased the intermediate 4-nitrophenolate using UV-Vis absorbance. The experiments showed the order catalytic activity as followed 75 mg zeolit@Ni@Cu > 100 mg zeolit@Cu-Ni > 75 mg zeolit@Cu@Ni > 75 mg zeolit@Cu to reduce 4-nitrophenol with the concentration is 8.6 x 10⁻⁵ M, while zeolit@Ni was not active. The obtained value of the reduction rate constants for each catalyts. Were zeolit@Cu k= 0.0814 menit⁻¹, zeolit@Cu@Ni k= 0.26 menit⁻¹, zeolit@Cu-Ni k= 0.118 menit⁻¹, and zeolit@Ni@Cu k=0.213 menit⁻¹., Surface modification of a material is very interesting to observe. In this research, modification of Indonesian nature zeolite with bimetallic nanoparticle Cu and Ni has done for the catalytic reduction of 4-nitrophenol. Bimetallic

nanoparticles have been successfully immobilized into natural zeolite after reducing the immobilized Cu^{2+} and Ni^{2+} with NaBH_4 . The synthesized catalysts (zeolit@Ni, zeolit@Cu, zeolit@Cu@Ni, zeolit@Cu-Ni, and zeolit@Ni@Cu) could decrease the intermediate 4-nitrophenolate using UV-Vis absorbance. The experiments showed the order catalytic activity as followed 75 mg zeolit@Ni@Cu > 100 mg zeolit@Cu-Ni > 75 mg zeolit@Cu@Ni > 75 mg zeolit@Cu to reduce 4-nitrophenol with the concentration is 8.6×10^{-5} M, while zeolit@Ni was not active. The obtained value of the reduction rate constants for each catalysts. Were zeolit@Cu $k = 0.0814 \text{ min}^{-1}$, zeolit@Cu@Ni $k = 0.26 \text{ min}^{-1}$, zeolit@Cu-Ni $k = 0.118 \text{ min}^{-1}$, and zeolit@Ni@Cu $k = 0.213 \text{ min}^{-1}$.]