

SINTESIS $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$ SEBAGAI FOTOKATALIS UNTUK DEGRADASI ASAM BENZOAT DI BAWAH RADIASI SINAR TAMPAK

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INTISARI

Telah dilakukan sintesis $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$ dan pengujiannya sebagai fotokatalis untuk degradasi asam benzoat. Material $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$ berhasil disintesis dengan metode kopresipitasi, hidrolisis dan sol-gel. Sintesis diawali dengan preparasi magnetit melalui metode kopresipitasi dan sonikasi, selanjutnya dilakukan pelapisan magnetit menggunakan silika dengan metode sol-gel, dilanjutkan pelapisan TiO_2 serta doping logam Cu dilakukan menggunakan metode sol-gel dan diikuti perlakuan termal pada suhu 500 °C. Hasil sintesis material $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$ dikarakterisasi menggunakan XRD, FTIR, SEM-EDX, TEM, dan SR-UV. Uji aktivitas material $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$ dievaluasi sebagai fotokatalis untuk mendegradasi asam benzoat pada paparan sinar tampak

Hasil penelitian menunjukkan bahwa material $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$ telah berhasil disintesis. Material $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$ memiliki kemampuan yang baik sebagai fotokatalis untuk mendegradasi asam benzoat pada paparan sinar tampak. Hasil uji degradasi asam benzoat menunjukkan material $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$ 1% memiliki aktivitas paling baik pada radiasi sinar tampak (90,08%), pada pH 8 dan waktu 60 menit pada paparan sinar tampak. Fotokatalis $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$ 1% dapat digunakan berulang sampai 4x pengulangan dengan hasil degradasi asam benzoat yang tidak berubah secara signifikan. Secara keseluruhan, reaksi fotodegradasi asam benzoat mengikuti kinetika orde dua semu Ho dan McKey pada paparan sinar tampak.

Kata Kunci : $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Cu}$, asam benzoat, fotokatalis, sinar tampak, degradasi

SYNTHESIS OF Fe₃O₄/SiO₂/TiO₂-Cu AS A PHOTOCATALYST FOR DEGRADATION OF BENZOIC ACID UNDER VISIBLE LIGHT RADIATION

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ABSTRACT

The synthesis and the test of Fe₃O₄/SiO₂/TiO₂-Cu as photocatalyst for benzoic acid degradation had been carried out. Fe₃O₄/SiO₂/TiO₂-Cu materials were successfully synthesized by co-precipitation, hydrolysis and sol-gel methods. Synthesis was started with magnetite preparation through the co-precipitation and sonication method, then the magnetite coating using silica was carried out using the sol-gel method, followed by TiO₂ coating and Cu metal doping with the sol-gel method and thermal treatment at 500 °C. The synthesis products of Fe₃O₄/SiO₂/TiO₂-Cu materials were characterized by using XRD, FTIR, SEM-EDX, TEM and SR-UV. The material activity test of Fe₃O₄/SiO₂/TiO₂-Cu was evaluated as a photocatalyst to degrade benzoic acid under visible light exposure.

The results showed that the Fe₃O₄/SiO₂/TiO₂-Cu material was successfully synthesized. Fe₃O₄/SiO₂/TiO₂-Cu material has good ability as a photocatalyst to degrade benzoic acid under visible light exposure. Benzoic acid degradation test results showed that 1% Fe₃O₄/SiO₂/TiO₂-Cu material had the best activity on visible light radiation (90.08%), at pH 8 and 60 minutes under visible light exposure. Fe₃O₄/SiO₂/TiO₂-Cu 1% can be used repeatedly until 4x repetitions with the result of benzoic acid degradation that does not change significantly. Overall, the photodegradation reaction of benzoic acid follows Ho and McKay's second-order kinetics under visible light exposure.

Keyword: Fe₃O₄/SiO₂/TiO₂-Cu, benzoic acid, photocatalyst, visible light, degradation