SINTESIS KOMPOSIT $Fe_3O_4/SiO_2/TiO_2$ TERSENSITISASI POLIANILIN SEBAGAI FOTOKATALIS UNTUK REDUKSI ION Ag(I)

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INTISARI

Sintesis komposit $Fe_3O_4/SiO_2/TiO_2$ tersensitisasi polianilin (PANI) telah dilakukan. Penelitian ini bertujuan melakukan sintesis dan uji aktivitas $Fe_3O_4/SiO_2/TiO_2$ tersensitisasi polianilin. Sintesis komposit $Fe_3O_4/SiO_2/TiO_2$ tersensitisasi polianilin dilakukan secara bertahap yaitu sintesis Fe_3O_4 dengan metode sonokopresipitasi, pelapisan SiO_2 dan TiO_2 dengan sol-gel, kemudian sensitisasi polianilin dengan polimerisasi oksidatif. Hasil sintesis dikarakterisasi dengan metode spektrofotometri inframerah, *X-Ray Diffraction* (X-RD), *Transmission Electron Microscopy* (TEM), *Scanning Electron Microscopy-Energy Dispersive X-ray* (SEM-EDX) dan *Specular Reflectance Ultra Violet-Visible* (SR UV-Vis) *Spectrophotometry*. Aktivitas material $Fe_3O_4/SiO_2/TiO_2$ tersensitisasi polianilin dievaluasi melalui fotoreduksi ion Ag(I) pada paparan sinar tampak dan UV.

Hasil penelitian menunjukkan bahwa sintesis komposit $Fe_3O_4/SiO_2/TiO_2$ tersensitisasi polianilin telah berhasil dilakukan. Keberadaan Fe_3O_4, SiO_2, TiO_2 dan polianilin terlihat dengan adanya pita serapan pada bilangan gelombang berturut-turut: 1396, 1096, 477-795 dan 1437 serta 1576 cm^{-1}. Puncak difraksi pada 2θ: 29,94; 35,35; 45,14; 56,81 dan 62,80° menunjukkan keberadaan Fe_3O_4. Keberadaan *anatase* TiO_2 dibuktikan dengan adanya puncak difraksi pada 2θ 25,14°. Energi celah pita komposit $Fe_3O_4/SiO_2/TiO_2$-PANI dengan rasio mol anilin/TiO_2 0, 1, 3, 5 dan 7% secara berurutan adalah: 3,23; 3,09; 3,08; 2,94 dan 2,90 eV. Aktivitas fotokatalitik terbaik komposit $Fe_3O_4/SiO_2/TiO_2$-PANI diperoleh pada rasio mol anilin/TiO_2 1%. Fotoreduksi 25 mL larutan Ag(I) 30 ppm terkatalisis 5 mg $Fe_3O_4/SiO_2/TiO_2$-PANI 1 pada pH 8 dan waktu reaksi 60 menit didapatkan persentase ion Ag(I) tereduksi sebanyak 35,08 dan 46,94% berturut-turut pada paparan sinar tampak dan UV.

Kata kunci: anilin, fotokatalis, sensitisasi, titanium dioksida

SYNTHESIS OF POLYANILINE SENSITIZED $Fe_3O_4/SiO_2/TiO_2$ COMPOSITE PHOTOCATALYST FOR Ag(I) ION REDUCTION

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ABSTRACT

Synthesis of polyaniline (PANI) sensitized $Fe_3O_4/SiO_2/TiO_2$ composites has been performed. This study aimed to synthesize and evaluate the activity of polyaniline sensitized $Fe_3O_4/SiO_2/TiO_2$ composites. The synthesis of polyaniline sensitized $Fe_3O_4/SiO_2/TiO_2$ composites was carried out in several stages; synthesis of Fe_3O_4 by sono-coprecipitation, coating of SiO_2 as well as TiO_2 by sol-gel method, then sensitization of polyaniline by oxidative polymerization method. The characterization was performed by infrared spectrophotometry, X-Ray Diffraction (X-RD), Transmission Electron Microscopy (TEM), Scanning Electron Microscopy-Energy Dispersive X-ray (SEM-EDX) and Specular Reflectance Ultra Violet-Visible (SR UV-Vis) Spectrophotometry. The activity of polyaniline sensitized $Fe_3O_4/SiO_2/TiO_2$ composites was evaluated on the photoreduction of Ag(I) ion in visible and UV light explosure.

The results showed that the polyaniline sensitized $Fe_3O_4/SiO_2/TiO_2$ composites was synthesized successfully. The existence of Fe_3O_4, SiO_2, TiO_2 and polyaniline was seen in the presence of absorption bands in: 1396, 1096, 477-795 and 1437 and 1576 cm^{-1} wavenumbers. Diffraction peaks at 2θ: 29.94; 35.35; 43.14; 56.81 and 62.50° showed the existence of Fe_3O_4. The existance of TiO_2 was proved with diffraction peak at 2θ 25.14°. The band gap energy of polyaniline sensitized $Fe_3O_4/SiO_2/TiO_2$ with aniline/TiO_2 mol ratio of 0, 1, 3, 5 and 7% were: 3.23; 3.09; 3.08; 2.94 and 2.90 eV, respectively. The best photocatalytic activity of polyaniline sensitized $Fe_3O_4/SiO_2/TiO_2$ composites was obtained in the mole ratio of 1% aniline/TiO_2. Photoreduction of 25 mL of Ag(I) 30 ppm solution catalyzed by 5 mg $Fe_3O_4/SiO_2/TiO_2$-PANI 1 at a pH of 8 and with the reaction time of 60 minutes gave the percentage of reduced Ag(I) ion were 35.08 and 46.94% under visible and ultraviolet irradiation, respectively.

Keywords: aniline, photocatalyst, sensitization, titanium dioxyde