SINTESIS NANOKOMPOSIT Fe_3O_4/TiO_2-Co SEBAGAI MODEL FOTOKATALIS BERSIFAT MAGNETIK

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INTISARI

Sintesis dan karakterisasi fotokatalis Fe_3O_4/TiO_2-Co serta uji aktivitasnya sebagai fotokatalis magnetik pada zat warna metilen biru telah dilakukan. Penelitian diawali dengan sintesis magnetit (Fe_3O_4) melalui sono-kopresipitasi, dilanjutkan dengan sintesis Co-*doped* TiO_2 dengan metode sol gel, kemudian pencampuran keduanya dengan variasi rasio Fe_3O_4:TiO_2 1:3; 1:9; 1:15 (FT3, FT9, FT15) dilanjutkan kalsinasi pada suhu 450 °C. Hasil sintesis dikarakterisasi dengan *fourier transform-infrared spectrophotometer* (FTIR), *X-ray diffractometer spectrophotometer* (XRD), *scanning electron microscope-energy dispersive X-ray spectrophotometer* (SEM-EDX), *UV-Specular reflactance spectrophotometer* (SR-UV) dan *vibrating sample magnetometer* (VSM). Uji aktivasi fotokatalitik Fe_3O_4/TiO_2-Co dilakukan dengan pencampuran zat warna metilen biru dalam reaktor tertutup yang dilengkapi dengan lampu ultraviolet dan visibel.

Hasil penelitian menunjukkan bahwa nanokomposit Fe_3O_4/TiO_2-Co mengalami pergeseran serapan ke daerah sinar tampak dengan adanya penambahan magnetit dan dopan Co. Meterial hasil sintesis memiliki energi celah pita maksimum pada FT3 yaitu sebesar 2,83 eV. Variasi rasio mol Fe_3O_4:TiO_2 diketahui dapat mempengaruhi besarnya momen magnet yang dihasilkan dan memberikan hasil optimum pada FT3 yaitu sebesar 2,0 emu/g. Kemampuan fotokatalitik Fe_3O_4/TiO_2-Co dalam zat warna metilen biru berlangsung lebih baik pada FT3 dengan hasil degradasi sebesar pada paparan visibel 32,58% dan 21,97% pada paparan UV.

Kata kunci: Co-TiO_2, magnetik, fotokatalis, metilen biru

SYNTHESIS OF Fe_3O_4/TiO_2-Co NANOCOMPOSITE AS MODEL OF PHOTOCATALYST WITH MAGNETIC PROPERTIES

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ABSTRACT

Synthesis and characterization of Fe_3O_4/TiO_2-Co nanocomposites and its photocatalytic activity test as magnetic photocatalyst using methylene blue had been done. The research was started with the preparation of magnetite through coprecipitation and sonication system, followed by preparation of Co-*doped* TiO_2 using sol-gel method and then mixed both of them with ratio of Fe_3O_4 : TiO_2 1:3; 1:9; 1:15 (FT3, FT9,FT15) and end by calcination. The product were characterized by using fourier transform-infrared spectrophotometer (FTIR), X-ray diffractometer (XRD), scanning electron microscope-energy dispersive X-ray spectrophotometer (SEM-EDX), UV-Specular reflectance spectrophotometer (SR-UV) and vibrating sample magnetomter (VSM). Photocatalytic activity test of Fe_3O_4/TiO_2-Co was conducted by mixing the photocatalyst with methylene blue solution in a batch system equipped with ultraviolet and visible light.

Result indicate that Fe_3O_4/TiO_2-Co nanocomposites have better absorption in the visible light because of the existence of cobalt and magnetite. The resulting material shows maximum value of band gap energy 2.83 eV in FT3. The effect of Fe_3O_4 : TiO_2 ratio known can affect the magnetic moment and showed the optimum result 2.0 emu/g in FT3. The magnetic character of Fe_3O_4/TiO_2-Co known can be affected by the magnetite crystalline size from the composites composition. The photocatalytic ability of Fe_3O_4/TiO_2-Co in methylene blue solution given a better activity for FT3 investigated by degradation result reached 32.58% in visible radiation and 21.97% in ultraviolet radiation.

Keywords: Co-TiO_2, magnetic, photocatalyst, methylene blue