

Preparation of Ag-Er doped TiO₂ nanocomposites and photo-catalytic activity

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[Introduction]

Removal of organic pollutants from water has become an issue of global concern. Photo catalytic degradation of organic pollutants is a promising method for water purification [1]. Titania (TiO₂) catalyzed photo degradation of pollutant is one of the clean techniques to remove organics without any harmful traces [2]. This work focuses on synthesis of Ag-Er-TiO₂ nanocomposites and investigation of their photo catalytic degradation of organic pollutants.

[Experimental Procedure]

TiO₂ composites were synthesized by solvothermal method [3]. Titanium tetraisopropoxide (0.5 M) was dissolved in 200 mL of butanol. Erbium nitrate and/or Silver nitrate dissolved in 57 mL of deionized water and then added into Titanium tetraisopropoxide solution and stirred for 10 h. Solvothermal growth was carried out in an autoclave at 150 °C for 25 h. The resulting products were dried and annealed at 350 °C. The same procedure was repeated with different erbium content. The prepared photocatalysts were characterized by UV-Vis, XPS, SEM, XRD and TEM. To study the photo catalytic efficiency of the catalyst, 75 mg of catalyst was suspended in 50 mL of 10 ppm Rhodamine B solution and stirred for 1 h in the dark. The solution was irradiated with a light (UV or Visible light) and absorbance of the solution was recorded at constant time intervals.

[Result and Discussion]

XRD peak at 2θ value 25.2° attributed to the (101) peak of anatase TiO₂ (Fig.1(a)). Absorption spectrum of Titania composites (Fig.1 (b)) confirmed the presence of Erbium (Er³⁺) and Silver (Ag⁰) into the samples. With nano silver deposition, the band edge of titania was red shifted. TEM image (Fig.1 (c)) of Ag-TiO₂ confirmed that nanoparticles ranging from 5-12 nm were interconnected with each other. The gradual decrease of Rhodamine B absorbance in the UV-Vis spectra indicated the degradation of Rhodamin B dye as shown in Fig.1 (d). The study demonstrated that Ag-Er doped titania composites exhibited higher photocatalytic activity than pure titania.

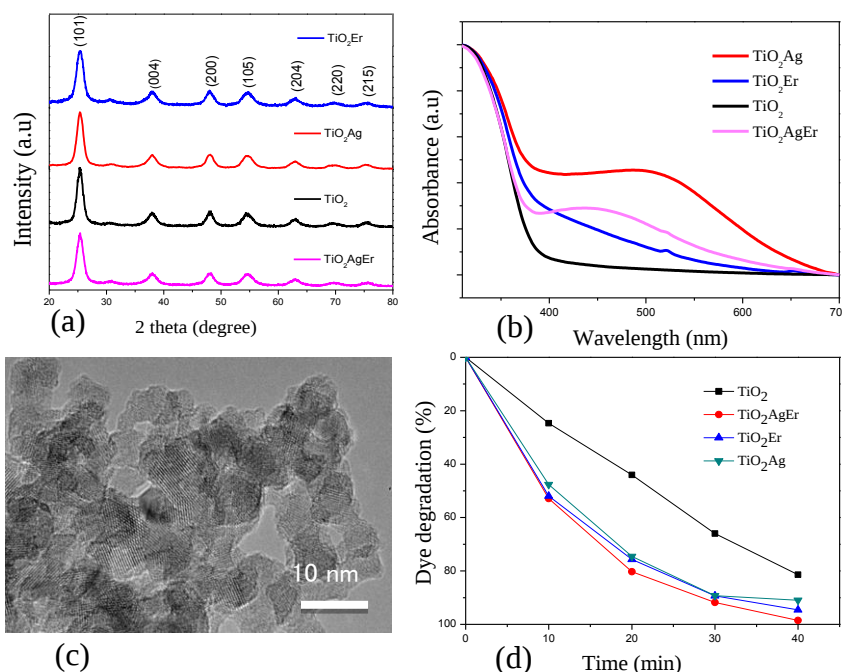


Fig.1 a) XRD of Ag-Er-TiO₂ composites, b) absorption spectra of composites, c) TEM image of Ag-TiO₂, d) photo catalytic activity

References

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- [3] Y.Hayakawa et.al, *J. Power Sources* **242** (2013) 803