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Light Sensitivity Enchase of TiO₂ Thin Films with Ferrite Nanoparticles Using Multi-source Spray Pyrolysis Method

L. Grinberga¹, I. Liepina², A. Sutka³, J. Kleperis¹, G. Bajars¹, G. Mezinskis³

¹Institute of Solid State Physics, University of Latvia, Latvia;

²Faculty of Chemistry, University of Latvia, Latvia;

³Institute of Silicate Materials, Riga Technical University, Latvia

e-mail: kleperis@latnet.lv

Energy crisis is the main stimulus for the design of structurally organized and functionally integrated artificial nanomaterial systems capable of harvesting solar energy. Titanium dioxide (TiO₂) as environmentally friendly and photo-catalytic material is attractive for numerous technological applications: gas sensors, pigments in foodstuffs, paints, cosmetics, in dye solar cells etc. The absorption edge of TiO₂ is in the blue part of visible light; therefore efficiency to solar light is low. ZnFe₂O₄ is another catalyst with a relatively small band gap (1.9 eV), which is used as co-catalyst to shift the TiO₂ absorption edge to visible light region of the spectrum, and simultaneously an effective photocatalyst due to its capability of utilizing visible light and good photochemical stability [1].

ZnFe₂O₄ nanoparticles obtained by auto-combustion method [2] can be used to synthesize TiO₂/ZnFe₂O₄ composites. In our work a spray pyrolysis method was used to obtain well-crystallized TiO₂/ZnFe₂O₄ thin films on ITO coated glass substrates heated above 350°C. We used two spray guns to obtain multi-layer TiO₂/ZnFe₂O₄ thin film structures. Optical properties and photo-activity of multilayer structures were measured.

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