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STUDY OF SOL-GEL PREPARED NICKEL DOPED TITANIA THIN FILMS

Rainer Pärna[1], Urmas Joost[1,2], Arvo Kikas[1], Tanel Käämbre[1], Ivar Kuusik[1], Ilmar Kink[1,2], Vambola Kisand[1,2]

[1]*Institute of Physics, University of Tartu, Riia 142, 51014 Tartu, Estonia,*

[2]*Estonian Nanotechnology Competence Center, Riia 142, 51014 Tartu, Estonia*

e-mail: rainer.parna@ut.ee

During the last two decades, TiO_2 has received great attention due to the many advanced applications in photocatalysis, solar energy cells, gas sensors, functional coatings etc. For practical applications the sol-gel method is widely used for preparation of TiO_2 films, since it has several advantages over other fabrication techniques.

In addition to pure TiO_2 the interest has steadily grown to study metal-ion doped TiO_2 [1]. The key idea here is to modify the electronic structure of the material by doping, which would effectively shrink the band gap. This is important for applications using sunlight.

The nickel in TiO_2 strongly influences the anatase-to-rutile transition temperature during precursor baking. Phase composition of nickel-doped TiO_2 is very important, since catalytic properties of that material significantly depend also on the TiO_2 crystal phase.

In the present work we study the formation and properties of nickel-doped TiO_2 films prepared by sol-gel method using XAS and more conventional methods like XPS, SEM and AFM. The results demonstrate that sizes of TiO_2 crystallites increase with increasing heating temperature. Also, at temperatures above 800 °C diffusion of nickel onto the surfaces results in increased concentrations of nickel compounds on the surfaces. The XAS results of nickel-doped films indicate anatase-to-rutile phase transition below 1000 °C whereas the pristine TiO_2 films retain the anatase structure.

References

1. J. Chen, M. Yao, X. Wang, *J. Nanopart. Res.* 10 (2008) 163