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BOOK OF ABSTRACTS

Gijón - Spain
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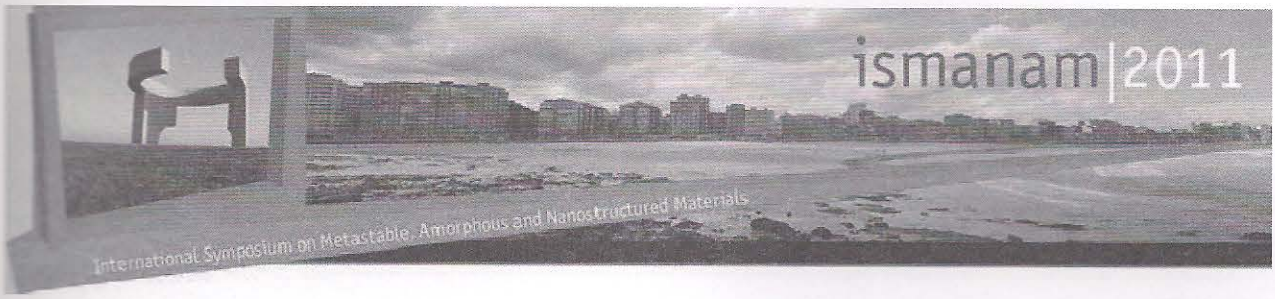
18th International Symposium on Metastable, Amorphous and Nanostructured Materials



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Symposium Organizers: **Pedro Gorria & Jesús A. Blanco**
Department of Physics
University of Oviedo
Oviedo, Spain

Frequency upconversion properties of Tm^{3+} doped TeO_2-ZnO glasses containing silver nanoparticles

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Thiago A. A. de Assumpção[1], Davinson M. da Silva[1,,#], Luciana R. P. Kassab[2], Anderson S. L. Gomes[3], Cid B. de Araújo[3], Niklaus U. Wetter[4]*

[1]Departamento de Engenharia de Sistemas Eletrônicos, Escola Politécnica, Universidade de São Paulo, 05508-970, São Paulo, SP, Brazil
[2]Laboratório de Tecnologia em Materiais Fotônicos e Optoeletrônicos, Faculdade de Tecnologia de São Paulo, CEETEPS/UNESP, 01124-060, São Paulo, SP, Brazil
[3]Departamento de Física, Universidade Federal de Pernambuco, 50670-901, Recife, PE, Brazil
[4]Centro de Lasers e Aplicações, Instituto de Pesquisas Energéticas e Nucleares (IPEN – SP), 05508-000, São Paulo, SP, Brazil
Corresponding author: davinsonm@gmail.com

Nucleation of metallic nanoparticles (NPs) in glasses may enhance the photoluminescence (PL) properties and the nonlinear optical response of the samples and this justify the current interest in these composites. In the case of tellurite glasses doped with Eu^{3+}, Tb^{3+} and Pr^{3+} the PL properties have been largely improved due to the presence of silver NPs, as reviewed in [1]. More recently, tellurite glasses containing silver NPs and co-doped with Tb^{3+}–Eu^{3+} and Yb^{3+}-Tm^{3+} were investigated. In both cases, large improvement of the frequency upconversion (UC) properties of the samples was obtained due to the influence of localized surface plasmons in the NPs [2, 3].
Here we report new UC experiments in a glass with composition of $85TeO_2$-15ZnO (in wt%). The doping species were $0.05Tm_2O_3$ and $2.0AgNO_3$ (in wt%). The samples were produced using the melt-quenching technique and the nucleation of the NPs was achieved by heat-treatment of the samples. A 200kV transmission electron microscope was used to monitor the NPs nucleation. For the PL experiments a CW ytterbium laser operating at 1050nm and an optical parametric amplifier pumped by a Nd:YAG laser delivering 5 ns pulses at 1047nm were used. Anti-Stokes PL bands were observed at 477, 650, and 800nm. The PL intensity dependence with the laser intensity indicates that three laser photons contribute for the emissions at 477nm and 650nm while the emission at 800 nm is due to the absorption of two photons. Enhancement of the UC intensities was observed as the amount of silver NPs increases due to the heat-treatment. Maximum 10 fold enhancement of the three PL bands was measured for the sample heat treated during 48 h. For longer heat-treatment PL quenching was observed due to the large NPs concentration and the reduced distance between the Tm^{3+} ions and the NPs.

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[2] L. R. P. Kassab, R. de Almeida, D. M. da Silva, T. A. A. de Assumpção, and C. B. de Araújo, J. Appl. Phys. 105 (2009) 103505.
[3] T. A. A. de Assumpção, L. R. P. Kassab, A. S. L. Gomes, and C. B. de Araújo, Applied Physics B: Lasers and Optics, (2010) doi: 10.1007/s00340-010-4258-5 (Published Online First: 19 October 2010).

Study of the Double Shell effect in functionalized magnetite nanoparticles used in protein separation

OR 58

Christian Chapa Gonzalez, Carlos A Martínez Pérez, and Perla E García-Casillas[1#]

Instituto de Ingeniería y Tecnología, Universidad Autónoma de Ciudad Juárez, Ave. Del Charro #610 norte, Col. Partido Romero, C.P.32320, Cd. Juárez Chihuahua, México
[#]Corresponding author: pegarcia@uacj.mx

Recently, functionalized magnetic nanoparticles have been studied for their potential application in drug delivery, protein targeting and separation [1-3]. The 5´-nucleotidase enzyme (5´-NT) is a bioindicator for diseases diagnosis such as cholestasis, hepatic ischaemia, liver necrosis, liver tumour, hepatitis and damage for hepatotoxic drugs [4]; for this reason targeted magnetite nanoparticles have been developed in order to separate this biomarker. This type of applications requires an strict control of the particle size and size distribution; The superparamagnetic behavior of the nanoparticles have been reported by most of the researches [5-6]. However, in the case of magnetite, a wide range of particle size has this behavior and no one describe the effect of the particle size on the enzyme protein, this paper describes the magnetic separation of 5'nucleatidase enzyme using a biofunctionalized magnetite nanoparticles obtained from two different methodologies where two different size were obtained 16 and 206 nm, respectively. Both nanopoarticles had spherical shape and superparamagnetic behavior. The coating effect of the silica, aminosilane and double shell of silica-aminosilane onto magnetite has been studied; having that the enzyme adsorption onto the functionalized nanoparticles was improved with the double coating. This magnetite silica-aminosilane was biofunctionalized with a ScFv antibody in order to target the 5'-nucleotidase with antibodies-antigen reaction and compare its ability to separate the biomarker with the commercial CD73 antibody. The magnetic separation of the biomarker with ScFv antibody it was found to be 28% greater than commercial CD73 antibody. The affinity of the ScFV antibody-5'nucleotidase was compared with other bioenzimes.
The morphology and particle size of the nanoparticles were characterized by Field Emission Scanning Electron Microscopy (FE-SEM), X-Ray Diffraction (XRD) was used in order to confirm the formation of crystalline magnetite. The polymeric coating was characterizedby means of Fourier Transform Infrared spectroscopy (FTIR). The conjugated antibody and isolated enzime were characterized by the determination of absorbance at 280 nm in a UV-Vis spectrometer.