SYNTHESIS AND CHARACTERIZATION TIO_2 POWDERS AND THIN FILM OBTAINED BY SOLVOTHERMAL METHOD FOR APPLICATIONS IN ENVIRONMENT FRIENDLY BUILDING MATERIAL TECHNOLOGIES

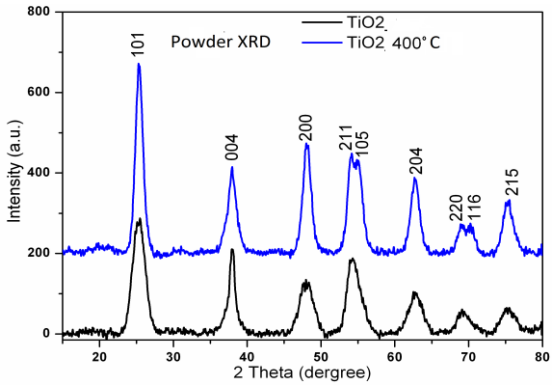
Florina Ştefania Rus[1], Petru Negrea[2], Paulina Vlăzan[1], Ştefan Novaconi[1]

[1]*National Institute for Research and Development in Electrochemistry and Condensed Matter, 144 Aurel Păunescu Podeanu St, 300569, Timişoara, România*
[2] *Politehnica University Timişoara, 2 Piaţa Victoriei, 300006, Timişoara, România*
e-mail:rusflorinastefania@gmail.com

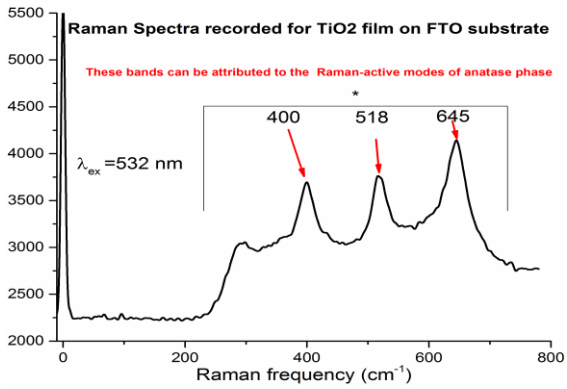
Abstract

The ability to fast obtain materials around specific application like design various new concept devices, such as gas sensors, catalysts, applications in environment friendly building material technologies with unique parameters of light absorption, solid state fuel cell, energy harvest, charge generation, and charge transport is thus vital to improving sciences and creating novel functionalities necessary for increasing implementation of photoactive materials [1].

Our research focus has been mainly on fast obtaining anatase TiO_2 in two forms: powder and film using solvothermal method. Characterization of the obtained compounds was achieved by X-ray diffraction (XRD), scanning electron microscopy (SEM), ultraviolet–visible spectrophotometry (UV-VIS), Raman Spectroscopy and Photoluminescence. Visible Raman spectra was recorded at room temperature on a Scanning Probe Microscopy (SPM) System with MultiView 1000 platform using 532 nm single-frequency laser as excitation source. The SE was carried out by Woollam VASE ellipsometer at (1.25 – 5) eV photon energy range at 55º- 75º angles of light incidence. The data analysis was performed with commercial Woollam CompleateEase software.



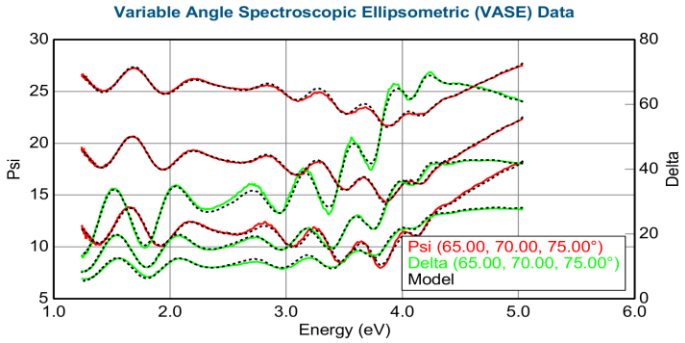
X'Ray Diffraction for TiO_2 powder



Raman spectra of TiO_2 film

Rietveld profile fitting of X-ray diffraction (XRD) pattern of the TiO_2 nanoparticles revealed highly crystalline anatase with P42/mnm structure. The anatase phases of TiO_2 could be sensitively identified by Raman spectroscopy based on their Raman spectra.

Variable angle spectroscopic ellipsometry (VASE) has been used to determine the optical properties of the TiO_2 film. The energy dependent ellipsometric angles Ψ and Δ were recorded for 3 angles. Measurement of ellipsometry was performed in the spectral range 1.24–5 eV at incident angles of 65-70-75°. The TiO_2 layer is approximated by a Kramers-Kronig consistent B-spline.



SE spectra for the TiO_2 film

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References

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