HYDROTHERMAL SYNTHESIS OF AgNW@TiO_2 CORE SHELL FOR *PLASMON-INDUCED* CHARGE SEPARATION

Daniel Ursu[1*], Radu Banica[1], Cristina Mosoarca[1]

National Institute of Research and Development for Electrochemistry and Condensed Matter, Dr. A.P. Podeanu street, No. 144, 300569, Timisoara, Romania
**e-mail:danielhoratiu@yahoo.com*

Abstract

AgNW@TiO_2 core shell architecture was synthesized by a facial hydrothermal method. The features of the sample were characterized by XRD, SEM, and UV-VIS-NIR. The hydrothermal synthesis was performed between 100 - 200°C using different concentration of Titanium butoxide (TBT)/ethanol as precursor.

From the X-ray diffraction spectra, one can see the corresponding diffraction maxima for Ag (01-087-0718) at the position 2θ = 38.201, 44.401 and 64.601; AgCl (00-006-0480) at position 2θ = 27.831, 32.244, 46.234, 54.830, 57.480 as well as for TiO_2 anatase (01-071-1169) at position 2θ = 25.156 and 47.782.

Figure 1a shows the SEM images of the AgNW@TiO_2 compound obtained by the hydrothermal method at different synthesis temperatures using an autoclave time of 12h. The average thickness of the nanowires is approximately 80 nm. It can be seen that the deposition of TiO_2 on the AgNWs surface is uniform. It can also be observed that in addition to the silver nanowires there is also a surplus of TiO_2 nanoparticles. Thus for the AgNW_3 experiment which is obtained at a temperature of 200°C, the silver nanowires are completely embedded in TiO_2 nanoparticles. Thus it can be said that the synthesis temperature affects the surface of the structures by detaching the semiconductor from their surface.

With the increase of the autoclaving temperature, it can be observed that the silver nanowires are embedded in TiO_2 and the fine structure of absorption maxima characteristic of AgNWs are observed very little. The plasmonic absorption characteristic of Ag reach the value of 350 nm and 380 nm. The absorption for TiO_2 is at the value of 265 nm (figure 1b).

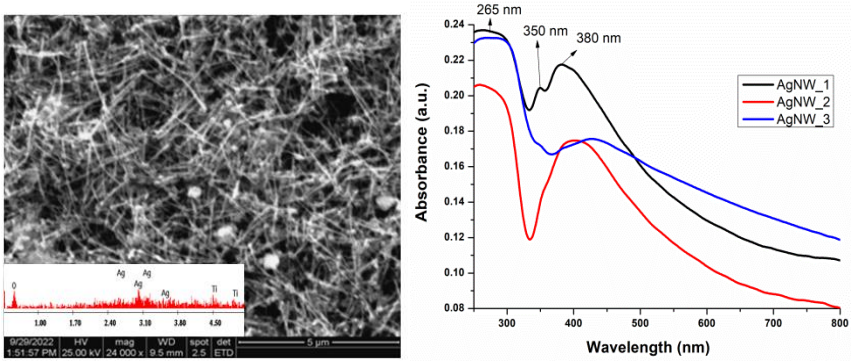

Fig.1 a) SEM images and b) absorbance spectra of AgNW@TiO_2 compound

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