

Designing nano-buildings based on TiO₂/WO₃/Au

Lucian Baia
Babes-Bolyai University, Romania

In the last decades, a large number of titania based composites were synthesized for improving the (photo) catalytic performances. The critical role in getting progress in this issue is certainly played by the understanding of the metal/semiconductor and semiconductor/semiconductor interfaces as well as of the composite's morphological particularities.

For this reason, titania/tungsten (VI) oxide/Au composites with various amounts of the constituent oxides and different porosities were synthesized by sol-gel method (with or without supercritical drying) followed by selective noble metal photodeposition on the desired oxide's surface (either on TiO₂ or on WO₃) and thermal treatment. The noble metal particles' localization was proved by scanning electron microscopy (SEM)/energy dispersive X-ray spectroscopy (EDX), while their size was obtained with the help of X-ray diffraction and transmission electron spectroscopy (TEM). The influence of the tungsten oxide on the structural and morphological properties of the composites was analyzed by performing X-ray photoelectron spectroscopy (XPS), diffuse reflectance spectroscopy (DRS), Raman and sorption measurements. From the applicative perspective, an essential role is played by the selective deposition of gold on the oxide's surface, and therefore, special attention was directed to understand the modifications of both the optical properties as well as surface particularities occurred as a result of Au deposition. Important changes related to the gap energy values and titania and tungsten species depending on the deposition type and tungsten amount were found. The morphological details were also comparatively analyzed for the aerogel like samples, i.e. supercritical dried, and xerogels.

Biography

Lucian Baia earned his Ph.D. degree in 2003 at the University of Würzburg, Germany. Since 2008, he works as Associate Professor at the Department of Condensed Matter Physics and Advanced Technologies. His current research focuses on obtaining and characterizing porous and highly porous nanoarchitectures with controllable morphology and structure for biomedical and environmental applications. He is author or coauthor of more than 65 peer-reviewed publications (h-index: 16), three books, and two book chapters, and is serving as an editorial board member of the ISRN Nanotechnology Journal and the Journal of Biosensors & Bioelectronics and Journal of Electrical & Electronics.

lucian.baia@phys.ubbcluj.ro

Bioactive glass-reinforced polymer composites for tissue engineering

Maziar Shah Mohammadi
The University of British Columbia, Canada

Phosphate-based glasses (PG) and their composites are of interest as bone repair and tissue engineering scaffolds due to the totally degradable nature of the materials. PG formulations provide a diverse range of solubility, which can be predicted and controlled by altering their composition. The versatility of PG formulation properties may be translated to a composite system by incorporation into a degradable polymer. Composites are an attractive approach as biomaterials since advantageous properties of different materials can be combined to satisfy the required mechanical and physiological demands of the host tissue. Composites based on biodegradable polymers and bioactive ceramics have been considered for bone tissue engineering, reconstruction and repair. Incorporation of ceramics and glasses into the polymer matrix should improve not only the mechanical properties of the material, but also its bioactivity and biological behaviour. Since the composition of the filler, content, and solubility are parameters that can influence composite properties, the tailoring of such properties is paramount. However, not all calcium phosphate materials are necessarily ideal. For example, hydroxyapatite (HA) or bioactive silicate-based glasses do not reflect the required dissolution properties. Therefore, producing a biodegradable composite material with controllable dissolution criteria is essential in bone repair and regeneration. For this purpose, phosphate-based glass (PG) formulations may be a potential alternative as the inorganic phase of biodegradable composites.

maziar.mohammadi@ubc.ca