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### **Particularities of the crystalline structures: A critical issue in designing materials for targeted applications**

The manipulation of the crystalline structure to get the maximum efficiency for a desired application is one of the most important challenges in the nanotechnology development. On the other hand, the shape and size control of the crystalline nanostructures represents another hot topic in designing novel materials with tuned properties. The presented work is split in three parts. The first one relates about the influence of morphological particularities of titania and tungstate crystals on the photocatalytic efficiency to decontaminate the polluted water. It is mainly evidenced the importance of the shape controlled nanostructures on the photocatalytic properties as revealed by the morphological and structural characterization of the investigated materials. The second one presents the tunability of the morphological, structural and optical properties of Graphene Oxide (GO) and reduced graphene oxide (r-GO) membranes that was achieved by using different self-assembly time and heat-treatment temperatures, respectively. The particularities of the GO and r-GO membranes will be discussed and correlated in the context of desired applications. The third part will describe the steps performed to understand the graphitization process, i.e. formation of 2D ordered carbon structures, inside the Bi/Fe doped carbon xerogels. This aspect is of an utmost importance having in view that such porous materials can be applied as electrode materials for energy storage and electrochemical sensing applications. In this respect, an exhaustive morphological and structural characterization of the Bi/Fe doped carbon xerogels was performed in order to identify the parameters that influence the activation of catalyzed graphitization.

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#### **Biography**

Lucian Baia is currently an Associate Professor at the Department of Condensed Matter Physics and Advanced Technologies at the Faculty of Physics of the Babeş-Bolyai University (BBU) of Cluj-Napoca, Romania. He is also the Head of the Institute of Research-Development-Innovation in Applied Natural Sciences from BBU. He was awarded the Constantin Miculescu Prize of the Romanian Academy (2017) as well as prizes of BBU for Scientific Excellence (2014 and 2017), Comenius Prize (2012) and STAR Advanced Fellowships for Research (2016). He has published more than 130 peer-reviewed papers, three books, five book chapters, 2 patents and 2 patent applications and is serving as Editorial Board Member for several scientific journals.

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