

11th International Conference and Expo on

Nanoscience and Molecular Nanotechnology

October 20-22, 2016 Rome, Italy

Synchrotron based picoscale local atomic structure characterization of advanced nanomaterials for nano-bio-med applications

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The study of nanoscale atomic structure of matter is important both from fundamental point of view for the understanding the nature of physical and chemical properties of the materials and for applied research as a basis for the synthesis of novel nanomaterials with the necessary for nano-bio-medical applications properties. To gain deep insight into the nature of the relation “Structure-Function” one has to use both computer nanodesign and advanced experimental methods for picodiagnostics. The status of modern theoretical analysis of the synchrotron based experimental x-ray absorption spectra to extract local atomic structural parameters is presented. Novel in situ technique for picodiagnostics-extracting of 3D local atomic structure parameters on the basis of advanced quantitative analysis of X-ray absorption near edge structure (XANES) has been developed. The possibility to extract information on bond angles and bond-lengths (with accuracy up to 1 pm) is demonstrated and it opens new perspectives of quantitative XANES analysis as a 3D local structure probe for any type of materials without long range order in atoms positions (all nanostructured materials and metallo-proteins belong to this class of materials). Nowadays, progress in the development of the synchrotron radiation facilities for time dependent measurements opened the possibilities for the study the atomic and electronic structure dynamics as well.

Biography

Alexander Soldatov has completed his PhD from Rostov State University (Russia) in 2002 and Post-doctoral studies from La Sapienza University (Rome, Italy). He is the Director of Smart Materials Research Center at Southern Federal University of Russia. He has published more than 230 papers in reputed journals and has been serving as an Editorial Board Member of several scientific journals.

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