Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION IX
New Frontiers in Multifunctional Material Science and Processing

Serbian Ceramic Society
Institute of Technical Sciences of SASA
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 20-21. September 2021.

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Surface chemistry and structural properties of proton-beam irradiated graphene oxide paper

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Graphene oxide (GO) is a promising material for the futuregraphene-based electronics where the surface chemistry and structural properties of GO may play an important role. One of the unique methods with great potentialfor controllable modification of materials' properties is the ion beam irradiation. In the present study, GO paper was irradiated with 15 keV proton-beam to a fluences from $5\times10^{16}$to 2×10^{17} ionscm^{-2}, while Fourier-transform infrared spectroscopy (ATR-FTIR), X-ray photoelectronspectroscopy (XPS) and Raman spectroscopy (RS)were used for the examination of surface chemistry and structural properties of the irradiated material. It was shown that proton beam irradiation leads to a partial reduction of GOwith the preferential removal of the alkoxy and epoxy groups. With the increasing fluence, the oxygen content from the XPS method and the intensity ratioof D and G Raman bandsboth showed decreasing trends. When oxygen content was compared to relative areas of specific functional groups and parameters of Raman peaks an interesting correlation was found that suggest optimal fluences for tuning the surface chemistry and structural properties of GO. The observed effects on surface chemistry and structural propertiescan be ascribed to physical and chemical effectsof ion beam irradiation. The interaction of functional groups with H-atom was investigated using DFT andsemi-empirical (SE) approach. SE calculations revealed that the reduction of the epoxy group appears at H-atom energies below 1.5 eV. This work identifies ion beam irradiation as a preferable technique for selective removal of surface oxygen groups and structural modification of GO where the applied fluence can be used for tuning the degree of change.