

SURFACE MODIFICATION OF GRAPHENE OXIDES

Krisztina László¹, Imre Bertóti², Shereen Farad¹, Tamás Igricz³, Miklós Mohai²

Presenting author's e-mail: klaszlo@mail.bme.hu

¹*Department of Physical Chemistry and Materials Science, Budapest University of Technology and Economics, Műegyetem rkp. 3, Budapest, H-1111, Hungary*

²*Research Centre for Natural Sciences, Hungarian Academy of Sciences, Budapest, Hungary*

³*Department of Organic Chemistry and Technology, Budapest University of Technology and Economics, Műegyetem rkp. 3, Budapest, H-1111, Hungary*

The various applications of nanocarbon materials including graphene and graphene oxides often require surface modification, which explains the great effort that has recently been devoted to such investigations.

The effect of various surface modification methods including mild thermal, chemical and radio frequency (RF) treatment will be compared in this presentation. These methods are simple ways alter the O/C ratio and thus among other features, the hydrophobic/hydrophilic character of the carbon nanoparticles.

In this work graphene oxide and its derivatives were thermally and chemically (ascorbic acid) treated as well as bombarded by inert (Ar) and reactive (N₂ plasma). Thermal analysis, FTIR and Raman spectroscopic methods were used to follow the changes in the sample. The surface composition was analysed by quantitative X-ray photoelectron spectroscopy (XPS). The chemical bonding of the heteroatoms to the carbon matrix was also investigated in detail.

The thermal, chemical and inert plasma treatments resulted in considerable reduction of the oxygen content. Plasma treatment with nitrogen was also capable to implant nitrogen atoms into the sub-surface atomic layers, accommodating them also in substitutional lattice sites. The nitrogen content, up to 10 at %, was influenced by the initial sample composition and the treatment conditions (bias, time). Three different chemical bonding states of the nitrogen were defined for the N₂ plasma treated samples and assigned to pyridine-type and to N in pyrrole-type ring structures, and to N substituting carbon in a graphite-like environment.