# Incorporation of N atoms in graphene oxide and the effects on structural, morphological, and electrical properties

**Svetlana Jovanović**[1]
Dejan Kepić[1], Gerard Tobías-Rossell[2], Stefania Sandoval Rojano[2], Muhammad Yasir[3], and Kamel Haddadi[4]
[1]*Vinča Institute of Nuclear Sciences - National Institute of the Republic of Serbia, University of Belgrade, Vinča, Belgrade, Serbia*
[2]Instituto de Ciencia de Materiales de Barcelona (ICMAB-CSIC), Barcelona, Spain
[3]*Department of Computing Science, University of Oldenburg, Oldenburg D-26129, Germany*
[4]*Institute of Electronics, Microelectronics and Nanotechnology (IEMN), 59650 Villeneuve-d'Ascq, France*
svetlanajovanovic@vin.bg.ac.rs

Due to the growing market need for electromagnetic interference (EMI) shielding materials, developing new, lightweight, eco-friendly, durable, sustainable, and efficient products is in the scientific spotlight.
Among various conductive and polymer-based materials, graphene and its composites showed numerous advantages for EMI shielding applications, such as lightweight, chemical resistivity, stiffness, and the ability to block electromagnetic waves by absorption. Although graphene shows promising chemical and physical properties, EMI shielding effectiveness is often below market demands of 20 dB. One of the approaches to increase the shielding effectiveness is the incorporation of heteroatoms into its structure [1].
Herein, graphene oxide was annealed for 1h at temperatures of 500 and 800°C, in the atmosphere of pure ammonia gas to achieve the incorporation of N atoms in GO structure [2]. The chemical structure was investigated using infrared and Raman spectroscopies, thermogravimetric, and elemental analysis. These measurements showed the presence of N atoms in GO structure, from 7.11 to 11.25 wt.%, while ratios between the D and G bands intensities calculated from Raman spectra were 1.15 and 1.18, for GO annealed at 500 and 800°C, respectively. When the graphene structure is n-type doped, these newly formed bonds between C and heteroatoms create additional sites for the local dipoles. Namely, due to the higher electronegativity of N compared to C, heteroatoms contribute to higher charge density in the π-delocalized cloud of graphene but also enhance the polarization effects. These effects lead to improved EMI SE of N-doped GO compared to as-produced GO.

## References

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