



# NATO Advanced Research Workshop

RPTU

## Functional Spintronic Nanomaterials for Radiation Detection and Energy Harvesting



### Spin dynamics in sucrose-derived luminescent carbon dot-silica nanocomposites

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Carbon dots (CDs) fabricated using sucrose as a carbon source show intense photoluminescence and good biocompatibility, opening the perspective to use them in bioanalysis and biomarking. Furthermore, the sucrose-derived luminescent carbon dot-silica nanocomposites (CDs@SiO<sub>2</sub>) are novel nanomaterials that exhibit strong white light emission covering the spectral range between near-ultraviolet and near-infrared regions. Thus, the CDs@SiO<sub>2</sub> nanocomposites are considered low-cost and low-toxicity fluorescent with a wide application area. This work is devoted to the electron spin resonance (ESR) characterization of the electronic structure of paramagnetic centers in CDs@SiO<sub>2</sub> nanocomposites as it relates to understanding material properties. The prime novelty of this research is the definition of the role of CDs in the magnetic and electrical properties of the sucrose-derived CDs@SiO<sub>2</sub> nanocomposites. In particular, we have determined the relation between CDs size and conductivity of the CDs@SiO<sub>2</sub> nanocomposites. The established metallic character of the CDs@SiO<sub>2</sub> conductivity caused by the quantum size effect occurring due to the reaggregation of the CDs is a significant result regarding the application of the CDs@SiO<sub>2</sub> nanocomposites for the fabrication of the optoelectronic devices and photoelements.