Atomic Configuration Analyses and Properties Studies of Carbon-Based and Related Nanomaterials via Spatially-Resolved EELS

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In the last two decades, transmission electron microscopes (TEM) have undergone a large number of improvements allowing few tens of meV (even lower) energy resolutions for a close to one angstrom electron beam. These performances offer new possibilities for probing the optical, dielectric and electronic properties of nanomaterials with unprecedented spatial information, as well as for studying the atomic configuration of nanostructures. In this contribution, I will present a selection of the recent works involving all these aspects, which are mainly related to atomically-resolved electron energy loss spectroscopy (EELS) studies. Thus, these works will illustrate the excellent capabilities offered by the use of a Cs probe corrected STEM, combined with the use of a monochromator, to study these properties within a very good spatial resolution. In particular, I will focus on the studies of carbon-based and related nanomaterials: fullerenes, nanotubes, nanodiamond and graphene, as well as other carbon-doped nano-objects and counterparts layered materials such as BxCyNz, or other dichalcogenides.