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Carbon nanostructures-based electrochemical (bio)sensors for the quantification of environmental and clinic markers

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Abstract:
This presentation will be focused on the importance of the rational functionalization of carbon nanotubes for the successful development of sensitive and selective electrochemical (bio)sensors devoted to the quantification of clinical and environmental markers.

Key words: Carbon nanostructures, Electrochemical (bio)sensors, Biomarkers, Environmental markers, Functionalization.

The advent of Nanobiotechnology has changed the paradigms of (bio)sensing due to the unique properties of nanomaterials. In particular, after the first carbon nanotubes (CNTs)-based electrochemical sensor reported twenty-one years ago, CNTs have received enormous attention for the development of electrochemical (bio)sensors.
This presentation will describe new avenues for the design of (bio)analytical platforms based on the rational selection of the CNTs-functionalization scheme. We will emphasize the importance of selecting a functionalization agent able not only to minimize the interaction between the CNTs but also, and even more important, to give to the nanostructures unique (bio)recognition properties like ligand-metallic cation; enzyme-substrate; DNA-intercalator; avidine-biotin and lectine-glycosidic compounds. Different examples will be discussed to demonstrate the importance of the strategy used to functionalize the CNTs involving enzymes (glucose oxidase, cytochrome c); peptides (polyhistidine, polylysine, polyarginine, polytyrosine); aminoacids (cysteine); nucleic acids (double stranded calf-thymus DNA) and proteins (avidine, concanavaline A). The advantages of electrochemical (bio)sensors obtained by modification of the suitable transducer with the resulting functionalized carbon nanomaterials will be demonstrated in connection with the quantification of (bio)analytes of clinical and environmental relevance.
In summary, the rational functionalization of carbon nanomaterials, the robust immobilization of the resulting modified nanostructures at the transducers surfaces and their efficient incorporation in supramolecular architectures, make possible the development of highly sensitive and selective bioanalytical devices with great potential to become powerful analytical tools.

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