Carbon nanostructures for applications in regenerative and nano-medicine

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The tailoring of functional interfaces based on nanostructured sp^2 and sp^3 coordinated carbons to produce platforms, grafts and scaffolds, is presently giving an edge to biomedical applications, going from tissue engineering and generation of artificial organs to fabrication of prosthetic and packaging systems

The shaping of nanoC-based materials able to mimic the nanostructures of natural extracellular matrices is obtained in our labs by the combined use of several CVD growth techniques, of MW-RF plasma sculpturing, and of wet chemistry processes. The control of surface chemistry of the C nanostructures offers an added value for interactions with biological systems

Relevant examples of multivalent architectures, characterized by biocompatibility and long-time reliability are

- for C-sp^2; few-layers graphene assembled in shaped platelets; high density arrays of conical nanostructures; dendrimers with various shape/branching; arrays of carbon nanotubes
- for C-sp^3; shaped aggregates of nanodiamond grains and nanocrystalline diamond films; arrays of 1D nanostructures (nanorods, whiskers, nanopillars, nanocones) obtained by plasma etching of diamond films.

The nanodiamond surfaces are not only excellent substrates for tissue growth, but can also selectively bind various biological molecules and are therefore considered for controlled administration of therapeutic agents.

This presentation will illustrate some relevant synthetic strategies for the engineering of nanocarbon-based platforms and some examples of multivalent systems for bio-related applications.