

## **Multifunctional hybrid architectures for biomedical applications**

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One of the most important challenges of the last years is represented by the synthesis of (bio)organic/inorganic hybrid structures with properties opportunely designed and changed by manipulating the organization of single components contributing to the realization of novel multifunctional and composite nanostructures that reflecting the synergy among the components, have the potential to overcome the functionality of traditional materials and address specific applications.

This presentation will report the most recent results in the design and fabrication of specialized systems involving properly functionalized nanoparticles and nanostructures with highly controlled physical and chemical properties and a careful surface engineering. In particular will be examined:

- 1) new multifunctional and multi-targeting nanomaterials for labelling and theranostic applications;
- 2) liposome systems to realize new hybrid biocompatible materials, such as mucus-penetrating liposomes, vesicle-encapsulated nanocrystals (NCs), and biomimetic functionalized surfaces;
- 3) inclusion complexes between variously functionalized cyclodextrines (as host systems) and natural or synthesized porphyrins (as guest systems) for both biomedical (photodynamic therapy, PDT) and biotechnological applications;