

Highly engineered catalytic nanomaterials for sensors, energy, and cultural heritage applications: a scientific and entrepreneurial approach

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IIT CCT Genova: Noble metal nanoparticles have attracted great attention for their impressive catalytic properties and enormous potentiality as artificial enzymes (nanozymes). To fully uncover their potential, it is necessary to control the shape of nanomaterials whilst keeping the ultra-small characteristics in order to achieve superior efficiency, selectivity and enhanced activity in catalytic and enzymatic processes. For Pd nanoparticles, we have developed new methods to achieve different geometrical shapes like cubes, rods and wires whilst maintaining the thickness (in the case of rods and wires) and the size (in the case of cubes) below ten nanometers. These highly engineered nanomaterials achieve biocompatibility together with interesting enzymatic and catalytic properties due to the absence of sticky molecules, high quality of the surface and the removal of toxic reagents.

For Pt nanocrystals, a "green" synthetic procedure has been developed to obtain ultra-small Pt nanocrystals by combining a strong and a weak reducing agent in aqueous environment in a single reaction vessel in only 10 minutes. Nanocrystals with size as low as 2.8 nm and high percentage of {111} surface domains have been achieved. These important characteristics are highly innovative and have proven ideal in hydrogen fuel cells application.

IIT CCHT@Ca'Foscari: Catalytic, plasmonic and graphene-based nanomaterials represent ideal candidates for the development of the new generation of protective coatings in Cultural Heritage. The approach design and early results will be presented and discussed.

Startup activity @HiQ-Nano: Thanks to the catalytic properties of Pt nanoparticles, **iBlue**, the first point-of-care, home-testing kit that enables to measure the total antioxidant level in saliva, in only 5 minutes has been launched on the market. More details can be found at the website: www.ibluelab.com.

The idea of iBlue kit has been developed considering the importance of antioxidants for human health and the lack in the market of an easy solution for home testing measurements.