A single and robust process for the production of a versatile family of nanorattle catalysts composed by naked nanoparticles comprised in silica nanocapsules

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Catalytic properties of materials are of dramatic significance in many technological sectors, among which automotive, chemical industry, and environmental remediation. Nanotechnology has revolutionized this field by improving the catalytic efficiency and selectivity of materials also by the enhancement of the surface-to-volume ratio.[1,2] Among the large portfolio of nanocatalysts, one of the most promising are the nanorattles (NRs), due to their peculiar structure that jointly provide stability and efficiency. Unluckily, the production of yolk-shell nanoplatforms is generally time-consuming, and the production protocols are extremely specific for each NRs.[3]

Starting from the passion fruit-like nano-architectures, we have developed a single low-cost synthetic process for the production of a family of nanorattles comprising noble metals, metal-oxide and/or carbonaceous materials.[4–6] Moreover, we have fully assessed, as a model reaction, their employment to methylene blue degradation. The possibility to employ a single scalable protocol for the production of various NRs with tuned features for specific reactions dramatically enhance their potential applications.

References:

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Short bio:
Valerio Voliani is a researcher at Center for Nanotechnology Innovation (CNI) @NEST, Istituto Italiano di Tecnologia. He has obtained the MSc in Chemistry and the PhD in Molecular Biophysics from Scuola Normale Superiore (Pisa, Italy). His efforts are devoted in filling the gap between inorganic nanomaterials and clinical applications by addressing the issue of metal persistence after the designed action. By applying the “ultrasmall-in-nano approach”, he has recently developed the “passion fruit-like nano-architectures”: an all-in-one inorganic nanomaterial able to jointly combine most of the intriguing behaviours of metal nanoparticles with their excretion from organism. He is also actively engaged in the development of innovative nanocatalysts for automotive exhaust gas treatment and environmental remediation.