TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

Dipartimento di Scienze e Tecnologie Chimiche

AVVISO DI SEMINARI

Il giorno 10/06/2019 alle ore 12:00

nell'Aula Seminari del Dipartimento di Scienze e Tecnologie Chimiche

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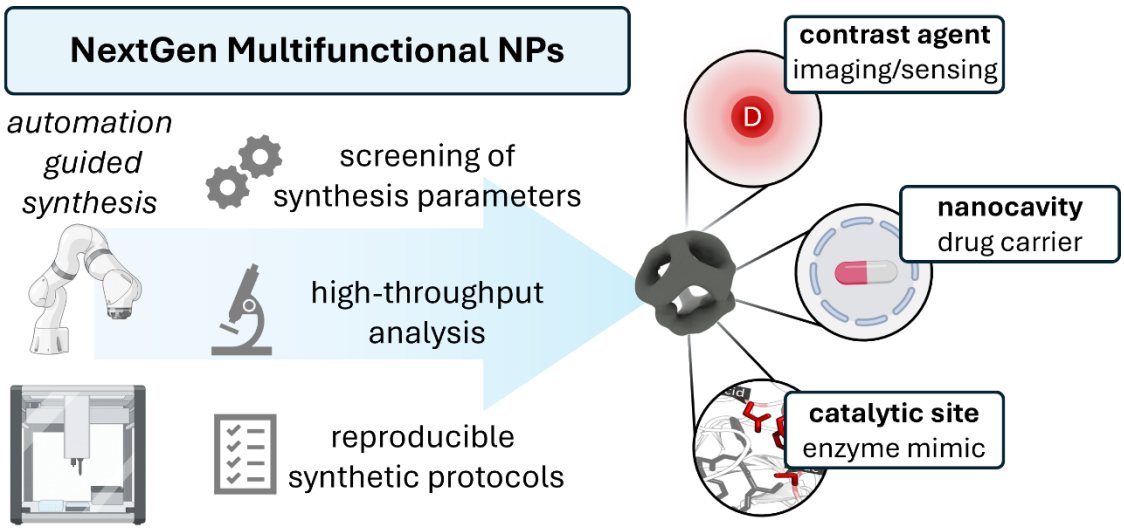
Terrà un seminario dal titolo:

Organosilica-Based Nanomaterials:
A Versatile Platform for the Design
of Multifunctional Nanoparticles

Proponente: Prof. Alessandro Porchetta

Abstract:

The application of nanomaterials has brought significant progress in various fields, including energy storage, medicine and catalysis. Despite this progress, a major challenge persists: the development of novel synthetic methodologies that can yield nanomaterials which are not only stimuli-responsive but also truly multifunctional.[1] Ideally, such systems should be prepared from a minimal number of non-toxic building blocks to ensure safety and biocompatibility, while maintaining chemical stability suitable for a broad range of applications. In this context, organosilica-based nanomaterials have emerged as highly promising candidates.[2] They offer several advantages, including cost-effective and scalable sol-gel synthesis, ease of integration into composite materials, stability in biologically complex media, and inherent biocompatibility.
This presentation will highlight recent design strategies for developing responsive organosilica nanoparticles, with a focus on approaches for integrating a diverse range of functional components–ranging from small organic molecules to nucleic acids–directly into the nanoparticle framework.[3] These modifications endow the nanoparticles with multifunctional properties tailored to specific applications, such as drug delivery, sensing, or catalysis. Their applications will be discussed, including their use as stimuli-responsive drug delivery carriers and enzyme-mimicking catalysts in cells—both of which have been recently developed by our group. Finally, the integration of cutting-edge robotics for the synthesis of these nanomaterials, enabling synthesis of nanomaterials with minimal human intervention, is discussed in the context of the HELMHOLTZ Acceleration Alliance (HELMA),[4] developed at KIT. HELMA aims to advance autonomous, artificial intelligence/machine learning-driven research through self-driving labs, with a particular focus on accelerating innovation in health technologies via biomedical engineering and the digital transformation of materials discovery.



References and notes

1. A. G. Slater et al. *Science* **2015**, *348*, 6238.
2. [a]S. Inagaki et al. *Nature* **2002**, *416*, 304-307. [b]N. Mizoshita et al. *Chem. Soc. Rev.* **2011**, *40*, 789-800
3. [a]P. Picchetti et al. *J. Am. Chem. Soc.* **2023**, *145*, 22903-22912. [b]P. Picchetti et al. *J. Am. Chem. Soc.* **2023**, *145*, 22896-22902. [c] P. Picchetti et al. *J. Am. Chem. Soc.* **2021**, *143*, 7681-7687.
4. URL: https://www.helma.kit.edu/