Title	**Atomically Precise Metal Nanoclusters**
PI	Maran, Flavio
Research Group	Molecular Electrochemistry and Nanosystems
Curriculum	Scienze Chimiche
Location	Dipartimento di Scienze Chmiche (DISC)
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Project description:

Our main focus is on the study of atomically precise thiolate protected gold nanoclusters, which is a very hot area of current research. In these molecular systems, which have metal-core diameters of 1-1.8 nm, the number and nature of the metal atoms and capping ligands are clearly defined. We believe that proper understanding of the molecular physicochemical properties is crucial to devise original applications of these systems, as such or in aggregates. Besides gathering expertise in the control of their synthesis, purification, modification, and characterization, the MEN group has expertise in the modification of gold nanoclusters by metal doping and ligand exchange reactions. From a physicochemical viewpoint, we are especially skilled, also with the support of the expertise provided by collaborators, in the study of their electrochemical, nuclear magnetic resonance, magnetic, optical, and photophysical properties. These studies explore the behavior of tailor-made clusters in solution, films, powders, or crystals.
Doctorate projects are based on molecularly guided approach and strategies. Depending on the student preferences and skills, projects may be devised to explore various topics. Besides addressing fundamental research aspects, we now also aim at using the above knowledge to target specific energy, catalysis, and sensing applications.

Publications

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2. Fei, W.; Antonello, S.; Dainese, T.; Dolmella, A.; Lahtinen, M.; Rissanen, K.; Venzo, A.; Maran, F. Metal Doping of $Au_{25}(SR)_{18}^-$ Clusters: Insights and Hindsights. *J. Am. Chem. Soc.* **2019**, *141*, 16033-16045.
3. Agrachev, M.; Ruzzi, M.; Venzo, A.; Maran, F. Nuclear and Electron Magnetic Resonance Spectroscopies of Atomically Precise Gold Nanoclusters. *Acc. Chem. Res.* **2019**, *52*, 44-52.
4. Dainese, T.; Antonello, S.; Bogialli, S.; Fei, W.; Venzo, A.; Maran, F. Gold Fusion: From $Au_{25}(SR)_{18}$ to $Au_{38}(SR)_{24}$, the Most Unexpected Transformation of a Very Stable Nanocluster. *ACS Nano* **2018**, *12*, 7057-7066.
5. Dainese, T.; Agrachev, M.; Antonello, S.; Badocco, D.; Black,, D. M.; Fortunelli, A.; Gascón, J. A.; Stener, M.; Venzo, A.; Whetten, R. L.; Maran, F. Atomically Precise $Au_{144}(SR)_{60}$ Nanoclusters (R = Et, Pr) are Capped by Twelve Distinct Ligand Types of 5-fold Equivalence and Display Gigantic Diastereotopic Effects. *Chem. Sci.* **2018**, *9*, 8796–8805.
6. Antonello, S.; Dainese, T.; Pan, F.; Rissanen, K.; Maran, F. Electrocrystallization of Monolayer Protected Gold Clusters: Opening the Door to Quality, Quantity and New Structures. *J. Am. Chem. Soc.* **2017**, *139*, 4168–4174.

Main Collaborations:

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