

“Understanding and Engineering Catalytic Materials Using Nanocrystal Precursors”

**Virtual Seminar
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Matteo Cargnello
Assistant Professor
Department of Chemical Engineering
Stanford University

Abstract

Catalytic processes are central to the goal of a sustainable future. A promising approach in developing catalytic materials is represented by the design of catalytic sites based on the knowledge of reaction mechanisms and structure-property relationships and aided by computation, and in the precise synthesis of these sites at the atomic and molecular level. Nanocrystal precursors, with tunable active sites and compositions, can help in this mission. The goal of this talk is to show how this approach can provide not only fundamental understanding of catalytic reactions, but also a way to precisely engineer sites to produce efficient catalysts that are active, stable and selective for several important transformations. Advances in the synthesis of these materials will be presented. Examples of the use of these building blocks as supported systems, or in combination with hybrid organic materials, will be shown. This will be done to both understand trends in methane and CO₂ activation, and in the preparation of optimized catalytic systems combining multiple active phases. In all these examples, important efforts to obtain precious structure-property relationships will be highlighted with this knowledge used to prepare more efficient and stable catalysts for the sustainable production of fuels and chemicals.

Bio

Matteo Cargnello received his Ph.D. in Nanotechnology in 2012 at the University of Trieste (Italy) under the supervision of Professor Paolo Fornasiero. He was then a post-doctoral scholar in the Chemistry Department at the University of Pennsylvania (Philadelphia) with Professor Christopher B. Murray, before joining the faculty at Stanford in January 2015. He is currently Assistant Professor of Chemical Engineering and, by courtesy of Materials Science and Engineering and Terman Faculty Fellow at Stanford University. Dr. Cargnello is the recipient of several awards, including the ENI Award Debut in Research 2013, the European Federation of Catalysis Societies Award as best European Ph.D. thesis in catalysis in 2013, the Young Scientist Prize at the 16th International Congress on Catalysis in 2016, the Junior award from the European Rare Earth and Actinide Society in 2018, the Sloan Fellowship in 2018, the ANNIC Mid-Career Nanotechnology Scientific Award in 2019, and the Mitsui Chemicals Catalysis Science Award for Creative Work in 2020. General goals of the research in the Cargnello group pertain to solving energy and environmental challenges. Uniform and tailored nanocrystals and nanostructures are synthesized, studied and used for energy and environmental applications through catalytic processes, with emphasis on how to precisely control their structure to understand and exploit interactions between well-defined building blocks.

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