*Proceedings of the 12th World Congress on Mechanical, Chemical, and Material Engineering (MCM 2026)*
*August 18 – 20, 2026 – London, United Kingdom*
*DOI: 10.11159/iccpe26.001*

# Understanding and Engineering Catalytic Materials Using Nanocrystal Precursors

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Catalytic processes are central to a sustainable future. A promising approach in developing catalytic materials is represented by the design of catalytic sites based on the knowledge of structure-property relationships, and in the precise synthesis of these sites at the atomic level. Colloidal nanocrystals, 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 reaction sites and 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, both to understand trends in methane and $CO_2$ activation, and in the preparation of optimized catalytic systems combining multiple active phases. In all these examples, important efforts to obtain structure-property relationships will be highlighted, with this knowledge used to prepare more efficient and stable catalysts for reducing the emission of greenhouse gases and for the sustainable production of fuels and chemicals.