

# Chemical, Structural and Surface Transformations in Nanocrystals

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Nanocrystals (NCs) are among the most exploited nanomaterials to date due to their extreme versatility. A major focus of the talk will be on the recent progress on the study of chemical, structural and surface transformations in nanostructures, via both cation and anion exchange, as well as initiated by irradiation or by thermal annealing. Cation exchange is mainly operative in binary ionic compounds and involves replacement of the sublattice of cations with a new sublattice of different cations, while the sublattice of anions remains in place. Some of these transformations, as well as assembly, can now be followed *in situ* using dedicated transmission electron microscopes with new holder designs and new types of detection systems. An emerging area of research is that of anion exchange, especially in halide perovskites, in which the halide ions exhibit unusually high diffusivities. Mastering anion exchange in perovskite nanostructures, coupled with the possibility of preparing quantum confined structures, has opened new avenues in perovskite-based applications. Finally, new exciting directions have been uncovered recently through the development of plasmonic semiconducting nanoparticles and by the possibility to chemically adjust the density of free carriers in them. Applications of these materials range from catalysis to heavy metal recovery, sensing, photothermal and photodynamic therapy. The talk will also give an outlook on future developments in these various fields.