

Tailored Colloidal Nanocrystal Clusters of Iron-oxide for Diagnosis and Therapy

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Abstract: New states of order with unexpected, exploitable properties may arise from the purposeful growth of single-crystal, colloidal nanoscale particles (nanocrystals - NCs) with adjustable geometrical characteristics (size - shape). However, the growing request for advanced nanoscale entities, capable of multiple technological tasks and/or unconventional physics, stimulates efforts to shift from single-phase material NCs to the development of novel multicomponent nanostructures. We discuss the progress in complex colloidal systems of individual nanocrystals arranged in tailored cluster-like structures, with focus on those of iron oxide chemical origin. Such size-tunable (<100 nm) nanostructures are obtained by surfactant-assisted chemical strategies, offering a quick and wide phase-space exploration. We show that water-dispersible, of low-cytotoxicity colloidal assemblies address function-driven requirements in healthcare market. However, this attribute necessitates that we understand the evolution of their properties upon the assembly of their inorganic subunits.

Biography: Alexandros Lappas received a B.Sc. in Physics (1988) from the University of Crete and a D.Phil. in Chemical Physics (1993) from the School of Chemistry & Molecular Sciences at the Univ. of Sussex, where he also carried out post-doctoral work (1993-95) in fullerene-based magnets & superconductors. After his compulsory military service (1996-97) in Greece, he moved back to Sussex as a Visiting Lecturer. He was elected to a tenure-track Researcher (1999) in materials science at the Institute of Electronic Structure and Laser (IESL) in Greece, where he is presently a Director of Research (equivalent to a University Professor position). In parallel, Dr Lappas has taught materials physics courses as an Adjunct Professor at the University of Crete. His research addresses cooperative phenomena of interacting charge carriers and magnetic moments in functional, crystalline materials (oxides and chalcogenides) that benefit energy efficient technologies, ranging from information storage to image-guided therapeutics. Dr Lappas has published more than 90 refereed journal articles and given numerous invited lectures in international conferences. He is a “Fulbright Fellow – Greece” (2016-17) for lecturing and conducting research in the United States.

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