Poster MS7

Continuous Supercritical Fluids as a Versatile Route for the Synthesis of Hybrid Organic-Inorganic Nanoparticles

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One of the current major challenges in materials science is the design of functional nanostructures combining superior properties with reliable material processing technologies. Metallic and oxide nanoparticles, among others have a tremendous implication in various industrially relevant products, such as catalysis, sensors, environmental remediators, drug-delivery etc. All these applications highlight the necessity of not only sustainable production methods for nanoparticles but also control over their physical (size, shape and cristallinity through nucleation and growth) and chemical properties (composition, surface chemistry) with implication on their behavior. Herein we present an ultrafast and versatile route - continuous supercritical fluids - to synthesize hybrid organic-inorganic NPs with the tunability of their physical and chemical properties. Highly reactive palladium nanocrystals (Pd NCs) together with superparamagnetic ferrite nanoparticles ($MnFe_2O_4$, Fe_3O_4 NPs) have been chosen as metallic and oxide system respectively, to illustrate the influence of i) metal precursor, ii) capping ligand type and iii) capping strategy (in-situ or ex-situ functionalization) not only on the material's chemistry and properties but also on the colloidal stability and organization. Moreover the versatility of continuous supercritical route is that besides the preparation of improved materials, opens avenues towards new synthetic pathways, implying a faster practical alternative for adjusting and screening the reactions conditions.

References

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