NND05 : Nanoparticules et réactivité

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Content:

The nucleation and growth mechanisms at play during the synthesis of nanoparticles by physical or chemical processes do not strongly differ. Moreover, the nanoparticle reactivity towards an external stimuli may not depend on the synthesis approach chosen. The aim of this symposium is thus to bring together physicists, chemists, theoreticians to exchange their views and discuss the latest results related to the synthesis and use of nanoparticles.

To shed light on the nanoparticle synthesis and applications, the symposium will address the *in situ* and *operando* techniques, which have enabled real-time monitoring of structural, chemical, and morphological changes under actual reaction or working conditions. These methods provide unprecedented insights into the dynamic processes governing the nucleation, growth, assembly, and transformation of nanoparticles, which are often obscured in *ex situ* analyses. By capturing time-resolved data on parameters such as particle size, composition, and surface chemistry, researchers can better understand the mechanisms that determine material properties and performance. The integration of these advanced characterization techniques with machine learning offers a powerful synergy: the vast and complex datasets generated during *in situ/operando* experiments can be rapidly analyzed to uncover hidden correlations, predict optimal synthesis pathways, and guide adaptive experimental design. This combination will accelerate the discovery and optimization of nanoparticles with tailored functionalities for catalysis, energy conversion, medicine, and other high-impact applications.

This mini colloque co-organized by the GDR NINO (https://gdr-nino.cnrs.fr/) aims at discussing the state-of-the-art techniques employed for monitoring processes that lead to nanoparticle formation, assembly and transformations upon submitting them to different working conditions. Discussions between experimentalists (physicists and chemists), theoreticians and data scientists will be encouraged to promote machine learning developments for high-throughput characterization of nanoparticles and their properties.