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X-ray methods bridge the molecular and macro length scales in colloidal nanoscience

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The key to fabricating complex, hierarchical materials is the control of chemical reactions at various length scales. To this end, the classical model of nucleation and growth fails to provide sufficient information. Here, we illustrate how a combination of in situ X-ray spectroscopic, scattering and microscopic studies bridge the molecular- and macro- length scales. Moreover, we will present how synchrotron methods, far from merely providing new tools, are extending the ways we study, understand and design such complex structures. It gives complementary information about chemical reaction in solution and nucleation, growth and crystal phase transition of nanoparticles and their functionality in devices. [1-4] Finally, we will discuss the advantages and the pitfalls of the synchrotron methods for in situ and operando studies.

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