

Advanced Functional Nanomaterials School

Yachay Tech University-2020

Nanomaterials in solutions: colloidal synthesis and characterizations

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Abstract

In this course we will discuss the synthesis and the characterizations of nanomaterials in a liquid environment. Nanoparticles and nanostructured materials are indeed often synthesized in solutions via bottom-up routes. In these approaches, chemical and physical forces operating at the nanoscale are used to assemble basic units into larger structures of controlled morphology.

In a first step we will review the most important colloidal interactions and the mechanisms leading to the broad diversity of self-organized structures found in complex fluids. In a second step we will examine in detail a few examples where monodisperse nanoparticles or well defined nanostructured solids are obtained via reduction of salts, sol-gel approaches etc... and how they can be stabilized in solutions.

Finally the last sequence of the course will be dedicated to the description of classic tools (such as light scattering techniques, spectroscopies ...) that can be used to characterize nanomaterials and follow their formation in solutions. We will present some techniques and their underlying mechanisms through a few basic examples where the size, the structure or the properties of the nanomaterials are monitored during their synthesis.