MODELING AND CHARACTERIZATION OF THE MORPHOLOGY OF MULTIPHASE POLYMERIC NANOPARTICLES

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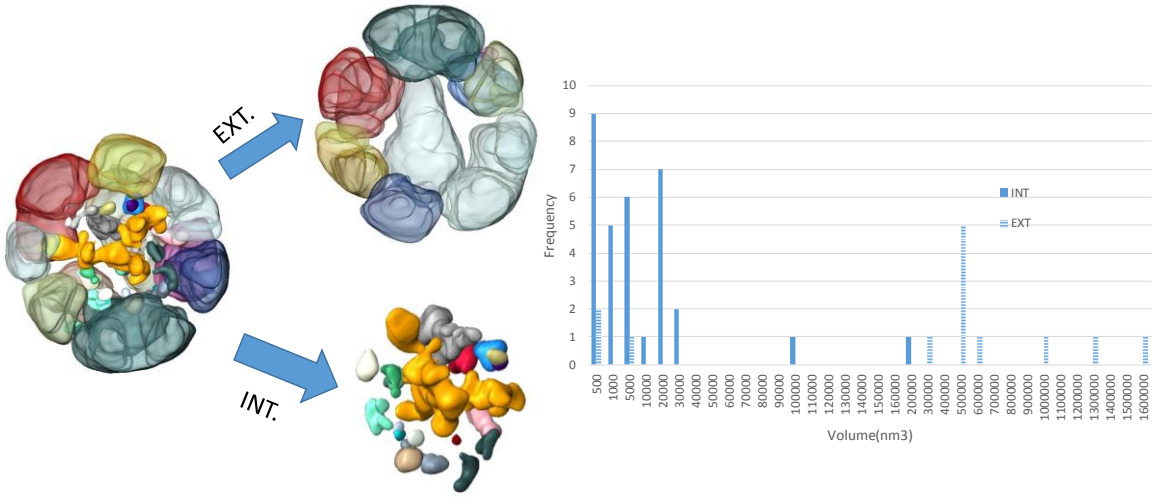
Multiphase polymeric nanoparticles that synergistically combine the properties of their constituents present enhanced properties and display new functionalities. Therefore, they are used in a wide range of applications including anticorrosive, superhydrophobic and anti-molding coatings; switchable adhesives; photoswitchable fluorescent particles; energy storage; gene and drug delivery; anticounterfeiting and LEDs. Although it is recognized that application properties strongly depend on the morphology of the nanoparticles, there is a surprising lack of progress towards the knowledge-based synthesis of these materials with well controlled morphologies. There are two main reasons for this. Firstly, the difficulties associated to the accurate characterization of the morphology of the polymeric nanoparticles, and secondly, the lack of quantitative understanding of the processes controlling the morphology.

This work is an attempt to overcome these limitations. For polymer-polymer latex hybrids, an image analysis technique was developed based on the HAADF STEM tomography of selectively stained latexes. This experimental determination yields to a precise description of the particle morphology from which the distribution of the phases can be quantitatively obtained. On the other hand, a dynamic mathematical model was developed which gives the evolution of the particle morphology for polymer-polymer and polymer-inorganic latex hybrids. In the model, the particle morphology was described as a size distribution of the clusters in the polymer matrix [1, 2]. Furthermore, the model was used to analyze the experimental distribution of phases.



References
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