Characterization of nanomotors behaviour by Fluorescence Correlation Spectroscopy

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Lots of effort has been recently devoted to the synthesis and characterization of self-propelling nanoparticles, also called nanomotors. These peculiar types of nanoparticles are able to self-propel in solution when in the presence of a so-called “fuel”. Depending on the type of nanomotors, the fuel can by an acid, a base or hydrogen peroxide, among others.

We developed a new method to synthesis nanomotors based on polystyrene dumbbell-shaped nanoparticles. Upon proper functionalization with platinum nanocrystals acting as catalysts for the decomposition of hydrogen peroxide, we have been able to synthesis relatively large amounts of nanomotors. However, characterization of their self-propelling behavior is complicated, as they are too small to be directly observed by standard optical microscopy techniques. We recently started collaboration with scientists having expertise with Fluorescence Correlation spectroscopy, which proved to be a powerful method to describe the motion of nanoparticles. The first results clearly indicate that the motion of the nanomotors is a normal Brownian diffusion when they are placed in water, but when the hydrogen peroxide fuel is added, the behavior changes to super diffusion, which is a clear proof that the nanomotors are self-propelling.

Discussion about the synthetic pathways used to prepare nanomotors will be presented, together with a presentation of the Line Fluorescence Correlation spectroscopy method and the associated results.