Measurements of Nanoparticle Size by Tracking Analysis

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It is well known how to estimate the hydrodynamic radius of a Brownian particle within a liquid, using the Stokes-Einstein equation, given the viscosity of the liquid and the coordinates' time variation of the particle, through the mean square displacement calculation and the successive determination of the diffusion coefficient. This procedure holds for submicron and nanoparticles too. The optical scheme of an ultramicroscope with a laser as an illumination source makes it possible to observe the Brownian motion of colloidal particles down to 10-20 nm in size. A highly sensitive digital camera can record a video of the Brownian motion of such particles. Analyzing the recorded video by means of special software, one can determine the change of the coordinates in time for each object in the video. Nanoparticle Tracking Analysis (NTA) is a method to measure the particle sizes based on this principle. In this work, we present a unique device with an original optical scheme and software developed in our laboratory jointly with Photocor company (Russia) able to measure the size of nanoparticles from the analysis of their Brownian motion in a liquid. We show the results of several standard nanoparticle reference sample measurements, their comparison with the results obtained from other experimental technique (DLS, TEM, SEM), along with an estimation of the applicability field for this instrument and the perspectives for studies of biological interest.