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BOOK OF ABSTRACTS

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Optical tweezers to interrogate nano-objects in fluid

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Light can apply force on matter by scattering and absorption. It is possible to use these forces by highly focused laser beams to form optical traps with the aim to manipulate micro and nanomaterials.

Optical tweezers were first realized by Arthur Ashkin in 1970. [1] He was the first to observe and study light scattering on microparticles and the resulting gradient force. This is a technique with which is possible to trap and manipulate nanometer and micrometer-sized material using a highly focused beam. Optical tweezers is a high sensitive technique used to manipulate objects by nanometer displacement and to apply picoNewton forces. [2]

Figure 1. Schematic view showing the reflection and refraction of two rays of light force acts on a dielectric sphere. Since his invention, optical traps have emerged as an interesting tool with several applications in physics and biology. [3] Nanomaterials have been used in many biological applications in particular for drug delivery. Translocation of micro and nanoparticle in biological fluid is currently under investigation. [4]

The aim of the work is to construct an optical trap and use it to manipulate nanomaterials. Here, we describe forces involved in trapping micro- and nano-objects and present the design of an integrated AFM-Raman-microscope and optical tweezers built using three laser sources. We also report trapping of a single polystyrene bead in fluid flow. In this experiment, the mobility of particles was studied to explain relationship between structure and the motion of the particle through the fluid using our optical tweezers system.

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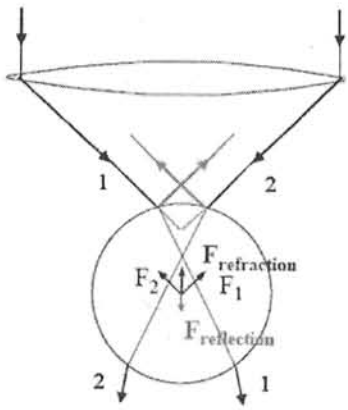

Fig. 1: Schematic view showing the reflection and refraction of two rays of light force acts on a dielectric sphere.