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MORPHOLOGY DEPENDENT RESONANCES FOR A MICROPARTICLE OPTICALLY TRAPPED ON THE SURFACE OF A WAVEGUIDE

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For light propagating in a dielectric waveguide, a part of the field extends into the cover medium. This evanescent tail can be used to manipulate microparticles provided that the refractive index of the particle is higher than that of the cover medium and the size of the particle is less than about 15μm. The optical forces due to the evanescent field act to guide the particle along the waveguide. The use of waveguides to trap particles combines the possibilities of optical tweezers with the techniques employed in integrated optics [1]. We have used counter-propagating waves from a high-power laser to trap particles suspended in water and on the surface of a waveguide. This makes it possible to move a particle both ways and hold it at a fixed position. We have then combined the light from the high-power laser (1083nm) with the light from a tunable laser (957-1000nm) and measured the light scattered by the particle as function of the wavelength (fig. 1). This gives the morphology dependent resonances (MDRs) of the particle. Optical microsphere resonators, with their exceptionally low optical losses and high Q-factors, are attracting a lot of interest in integrated optics and related fields. Not being accessible by free-space beams, modes of a microsphere resonator require near-field coupler devices. This method of trapping the particle and at the same time excite the MDRs, is new. The first results are promising, but the measured Q-values are low (<400) and improvements are thus necessary to fully exploit the microresonators.

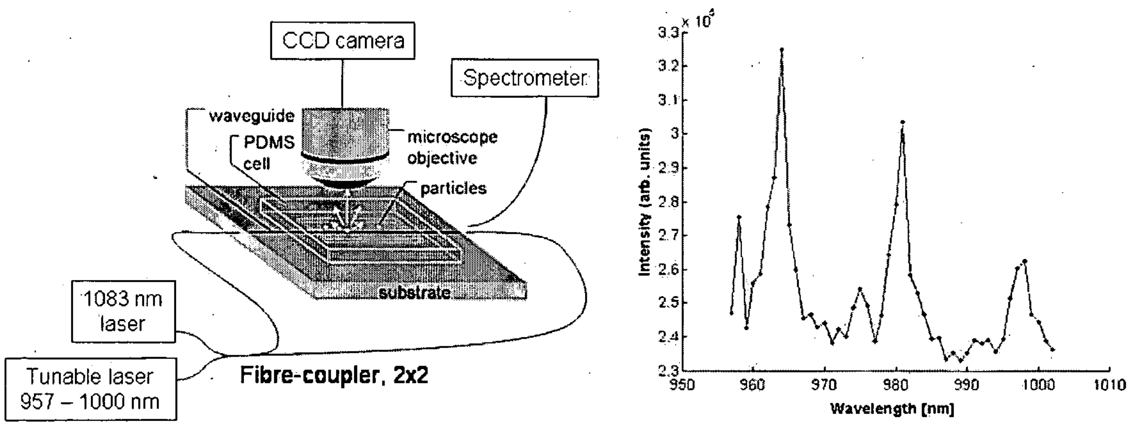

Figure 1 Set up with tunable laser and measured scattering vs. wavelength of tunable laser for 12μm diameter polystyrene microbead.

[1] K. Grujic, O.G. Hellesø, J.S. Wilkinson, J.P. Hole, Optics Express **13** 1-7 (2005).