OPTICALLY ASSEMBLED TUNABLE COLLOIDAL WAVEGUIDE

Brzobohatý O.[1], Chvátal L.[1], Jonáš A.[1], Šiler M.[1], Ježek J.[1]., Zemánek P.[1]

[1]*Institute of Scientific Instruments of the CAS, v. v. i., Královopolská 147, 612 64 Brno, Czech Republic*

Trapping and organized assembly of multiple particles or biological cells is of great importance for a wide range of applications, including general bio-photonic devices, cell-to-cell interactions and communications, and tissue engineering. Optical trapping is noninvasive and precise, and thus has potential for use in particle/cell trapping and assembly applications. For instance, optically formed highly ordered cell chains show excellent light propagation performance. And thus cell chains were used as bio-photonic waveguides [1]. Here, we prepare and study unconventional self-assembled colloidal waveguides held together by long-range optical forces [2]. This waveguide, formed from micrometer and sub-micrometer sized polystyrene spheres, has similar properties as gradient index fiber. We demonstrate externally tunable transmissivity of these colloidal waveguides and characterize the strong opto-mechanical interaction responsible for colloidal waveguides self-assembly. In particular, we report self-sustained oscillations of the whole photonic structure tuned so that the wavelength of the laser beams forming the colloidal waveguide can not propagate through the waveguide.

The research was supported by CSF (GA18-27546S), MEYS CR (LO1212), its infrastructure by MEYS CR and EC (CZ.1.05/2.1.00/01.0017) and by CAS (RVO:68081731).

[1] H. Xin, Y. Li, X. Liu, B. Li. *Nano Letters* **13,** 7 (2013).
[2] K. Dholakia, P. Zemánek, *Rev. Mod. Phys*. **82**, 1767–1791 (2010).