Shaping polymeric colloids with optical traps

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Previously, optical traps have been shown to mediate reversible phase transitions in polymer gels [1] and to cause coalescence of femtoliter-volume droplets and micelles [2]. Photon pressure-induced liquid-liquid phase separation and laser trapping crystallization were also demonstrated.

We present [3] a novel concept based on the idea that optical traps can be used not only to manipulate and order preformed materials (as previously demonstrated), but also to influence ongoing chemical reactions. We experimentally study how optical forces promote formation of polymeric micro-structures when applied on a dispersion undergoing emulsion polymerization. Through coalescence (fig. 1a) and partial fusion (fig 1b & 1c) of nucleation sites, quantitative control over size and shape is achieved. Furthermore, by adding inorganic nanoparticles, hybrid formations are produced.

The main advantage of this method is based on its modularity and flexibility. As optical forces may influence most of the dispersed systems, this approach could be applied to a wide variety of systems leading to formation of endless hybrid combinations.

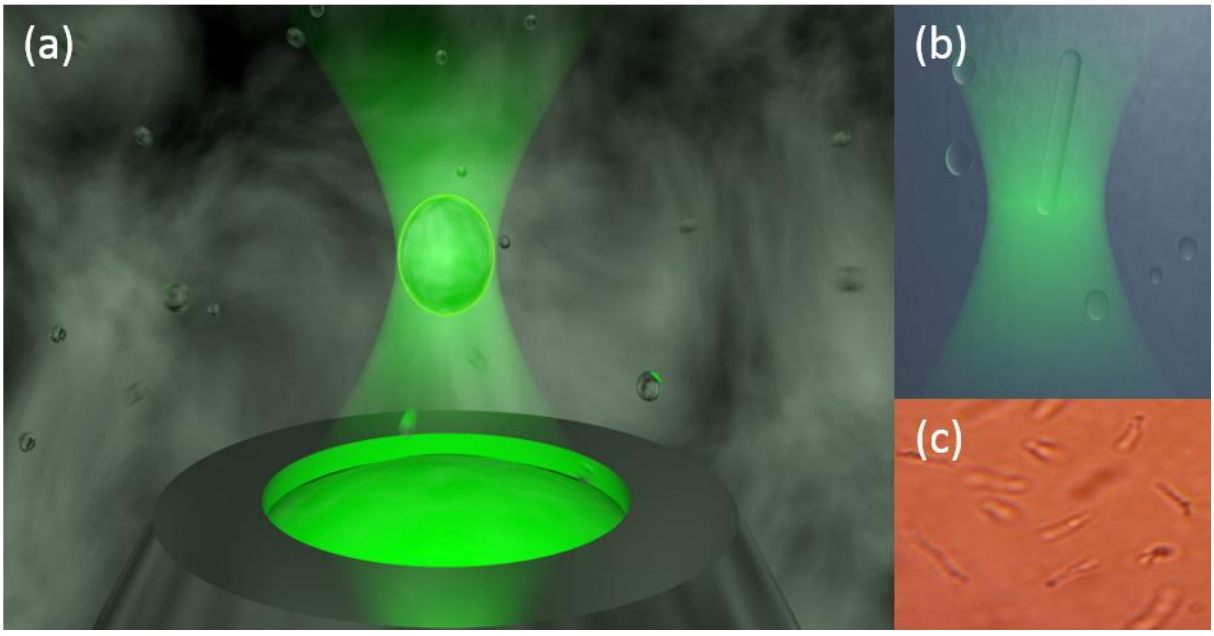

Figure 1. (a) Illustration of an optical trap promoting coalescence of nucleation sites in a dispersion undergoing emulsion polymerization. **(b)** Illustration of optical traps induced partial fusion, leading to rod like structures **(c)**.

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[2] J. Hotta, K. Sasaki, H. Masuhara, *J. Am. Chem. Soc.* **1996**, *118*, 11968.
[3] I. Jacob, E. Edri, E. Lasnoy, S. Piperno, H. Shpaisman, *Submitted*.