Laser Trapping Assembling Dynamics of Molecules and Nanoparticles

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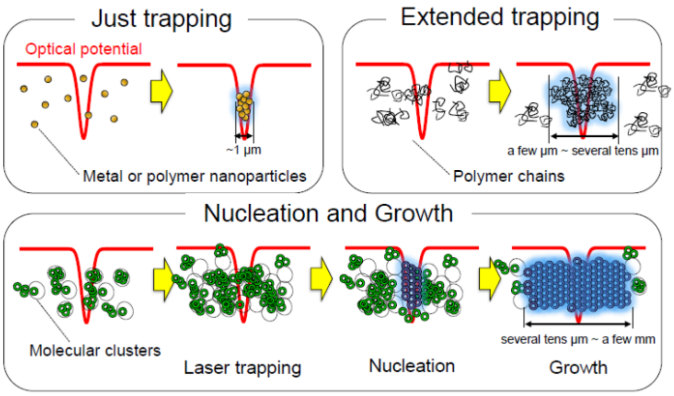
1. Trapping dynamics of nanoparticles with CW laser

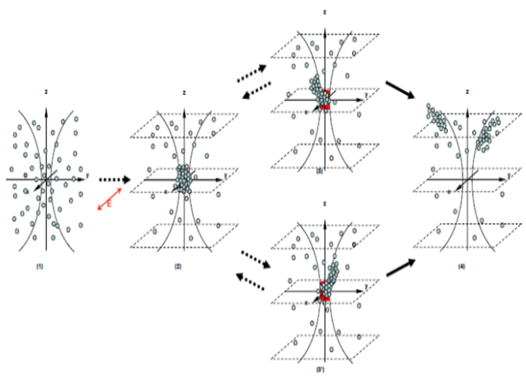
Since 1994 we have systematically studied laser trapping dynamics of polymers, micelles, droplets, liquid crystals, and metal and polymer nanoparticles in solution and summarized our results in Figure 1.

Figure 1.



2. Trapping and ejection dynamics of nanoparticles with femtosecond laser pulses

In addition to more efficient trapping of nanoparticles with femtosecond laser pulses than with CW laser, their ejection from the focus is observed for hydrophobic nanoparticles. The ejection direction is perpendicular to the polarization of the laser and alternatively switched in the time scale of seconds, giving symmetrical streams of the nanoparticles shown in Figure 2.



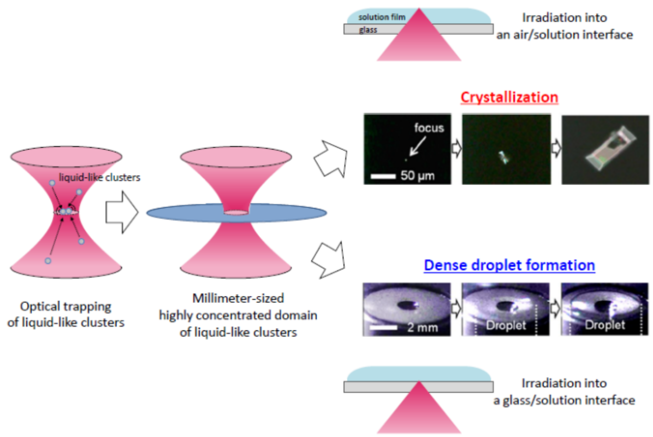


Figure 2 ***Figure 3***

3. Crystallization, phase separation, and domain formation by CW laser trapping

By focusing a CW laser at the surface of aqueous solution of amino acids, one single crystal is prepared. Upon the irradiation at solution/glass interface, a visible size lens-like droplet is formed due to liquid-liquid phase separation as shown in Figure 3. Both processes take place in the mm-sized concentrated domain which is formed due to strong hydrogen boding networks. The results suggest the high potential of laser trapping in future materials science.

(1) Sugiyama, T.; Yuyama, K.; Masuhara, H. *Acc. Chem. Res.* **2012**, *45*, 1946–1954.
(2) Chiang, W. -Y.; Usman, A.; Masuhara, H. *J. Phys. Chem. C* **2013**, *117*, 19182-19188.
(5 Yuyama, K.; Wu, C. -S.; Sugiyama, T.; Masuhara, H. *Photochem. Photobiol. Sci.* **2014**, *13*, 254-260.