

Nanoparticle collection using thermoplasmonics

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Abstract

Manipulation and control of suspended nanoparticles in a liquid is a challenging issue because of the strong diffusion nature of nanoparticles. The ability to manipulate nanoparticles on-demand is crucial for applications such as ultrasensitive sensing, early diagnostics, and environmental monitoring. An appropriate of spatial field gradients, such as light, temperature or electric field can be a beneficial tool to control the nanoparticles. Here, our recent research utilising thermoplasmonics for nanoparticle collection is introduced. Plasmonic nanoparticles or nanostructures as a source of heat remotely controlled by light irradiation. Then this heat generation induces several driving forces for suspended nanoparcles; radiation pressure, thermophoresis, and interfacial flow around microbubble. Different particle accumulation patterns can be obtained depending on the driving principle. We experimentally analyses these accumulation patterns and its dynamics by using fluorescent latex nanoparticles. Also, DNAs or proteins can be collected using the same phenomena.

Keywords: Nanoparticle, Plasmonics, Photothermal conversion, Interfacial flow

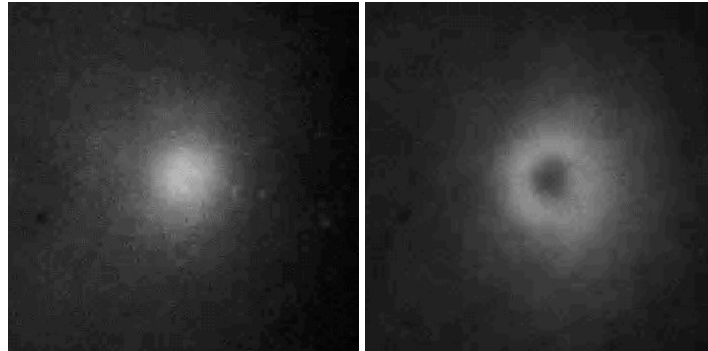


Figure 1. Thermoplasmonic nanoparticle collection with different accumulation patterns based on radiation pressure (left) and thermophoresis (right).

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