FABRICATION OF CRYSTALLINE SUBMICROMETER SPHERICAL PARTICLES AND THEIR OPTICAL AND MEDICAL APPLICATIONS

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Nanoparticles have been drawing great attention as a basic unit for nano-functional materials. However, actual application of these functions are quite limited. Nanoparticles are easily aggregated, and hence artisanal surface modification technique are necessary for further manipulation of nanoparticles, which often degrades nano-functions.

Recently we found that submicrometer spherical particles can be produced for various kinds of materials, such as metals (Au, Ag, etc.), oxides (ZnO, TiO_2, etc.) and semiconductors (Si, GaP, etc.) by unfocused laser beam irradiation onto colloidal solution of nanoparticles as raw materials [1]. In this process, raw nanoparticles are not ablated but melted by nanosecond laser irradiation to form liquid droplets, resulting in spherical particle formation by quenching.

These submicrometer spherical particles have many advantages over nanoparticles due to their specific shape. They are difficult to be aggregated due to the point contacts between spherical particles, and even aggregated they are easily redispersed. Submicrometer size is also beneficial for various applications. Optical application such as scatterers is promising [2], since light wavelength is in this size range. Medical application such as agents for cancer therapy is also hopeful due to the similar size range for enhanced permeability and retention effect near the targeted cancer cells. Examples of such application using submicrometer spheres are demonstrated in the presentation.

References

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