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ORGANIC NANOCRYSTRAL: PREPARATION AND SPECTROSCOPY

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Organic nanoparticles consisting of aromatic and dye molecules have attracted increasing attention, as they are expected to be useful as pigments, cosmetics, drags, and new materials for optical and electronic devices. Also, size dependent absorption and fluorescence spectra were reported for various nanocrystals ranging in their size from ten to several hundreds nanometer and dispersed in water. In this talk, I will present two topics; one is a noble method of organic nanoparticle preparation using laser ablation techniques, and another is the size-dependent optical properties of individual nanocrystals investigated by single particle spectroscopy coupled with AFM measurement.

1. Organic nanoparticle preparation by laser ablation. Despite metals and semiconductors, the difficulty of preparing organic nanoparticles with the size less than 100 nm has been well known. Recently, we have developed a novel method of organic-nanoparticle preparation, where microcrystalline powder suspended in a poor solvent was converted into the nanoparticle colloidal solution by intense pulse laser irradiation.[1,2] We have applied this method to several organic dyes such as phthalocyanine and quinacridone in water, and successfully obtained stable colloidal solutions of nanoparticles with a mean size of about 50 nm using nanosecond pulsed YAG laser as a light source. The colloidal solutions were stable for several days. Furthermore, their size was reduced into a 10 nm order by using a femtosecond laser. Nanoarticle formation and laser pulse-width dependence of the size will be discussed in terms of photo-thermal mechanism of laser ablation of organic solids.

2. Size dependent optical response of polydiacetylene nanocrystal.
Poly-(1,6-di(N-carbazolyl)-2,4-hexadiyne) (poly-DCHD) nanocrystals prepared by the reprecipitation method show strong optical response (both in scattering and absorption) in visible to near IR regions, and their colloidal dispersion in water exhibits a size-dependent absorption peak.[3] We have examined the size dependence by single particle spectroscopy using a far-field optical microscope coupled with AFM.[4] Rayleigh scattering spectra of individual nanocrystals were measured with a high-sensitive CCD spectrometer and their morphologies were