STUDY ON THE DIFFUSION OF NANO SCALE PARTICLES USING POLARIZED FLUORESCENCE CORRELATION SPECTROSCOPY

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KEY WORDS: Nano-particles, quantum dots, quantum rods, fluorescence correlation spectroscopy.

FCS (fluorescence correlation spectroscopy) technique based on the diffusion motion of particles in solution can analyze dynamic properties, which include a size, shape, background viscosity, and interaction with other particles of those, using the correlation function [1, 2]. There are various diffusion models for correlation function of particles. Of their models, the single particle diffusion model is appropriate to analyze a correlation function of the fluorescent molecules with a few nanometer scale such as rhodamine 6G, but is not proper to the function of semiconductor particles such as quantum dots and quantum rods.

In this study, we composed of a polarized FCS system for measurements of the correlation function of quantum dots and quantum rods with polarization state. The correlation functions of the particles were measured and analyze by applying the two particles diffusion model. The polarized FCS system was simply composed using polarization beam splitter in front of photo detector of conventional FCS setup. The correlation function was obtained by software correlator. The fluorescence generating from the sample was divided three polarization states these were horizontal, vertical and non-polarization with the linearly polarized laser source. The samples were prepared by colloid states of 1 nM concentration solution in distilled water. The quantum dots have a 18 nm diameter and the quantum rods have a 50 nm length with 5 nm widths.

In this study, we obtained the photophysical properties of nanoparticles such as particle aggregation, dependence of particle form for diffusion motion and their blinking phenomena. The blinking shows different results between the experimental results and fitted data. These results give a photophysical background in the research field of SMD (single molecule detection), polarization based confocal microscopy etc.

References: