Emission properties of Gold Quantum Dots on Polyelectrolyte multilayers Studied by Surface Plasmon Fluorescence Spectroscopy

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Gold Quantum Dots (AuQDs) exhibit quantum confinement effects, meaning that the number of gold atoms in the AuQDs determines the wavelength of the fluorescence emission in the visible range. Electron in AuQDs are excited from the ground state to the excited state by absorbing mainly near-UV light. The quenching / enhancement phenomenon of AuQDs, has been applied to biosensors, organic electronic devices and so forth.[1-2] There is a great deal of interest in studying the quenching and enhancement phenomenon of AuQDs by controlling the thickness of intermediate layer. In this work, we control the thickness of intermediate layer between the metal and AuQDs by polyelectrolyte multilayer ultrathin films. Poly(diallydimethylammonium chloride) (PDADMAC) and poly(sodium 4-styrenesulfonate) (PSS) were used as the polyelectrolyte layers. The polyelectrolyte multilayer was built up using a layer-by-layer absorption technique by sequentially dipping an aluminum-coated glass substrate into an aqueous solution of the positively charged PDADMAC and negatively charged PSS. Finally, a monolayer of AuQDs is deposited on PDADMAC/PSS films by spin-coating technique. The quenching / enhancement phenomenon of AuQDs by controlling the thickness of PDADMAC/PSS bilayers were monitored by surface plasmon fluorescence spectroscopy (SPFS). The PDADMAC/PSS film structure with Kretschmann configuration is shown in Fig.1. As the PDADMAC/PSS films thickness is increased, the fluorescence intensity of the AuQDs increases.

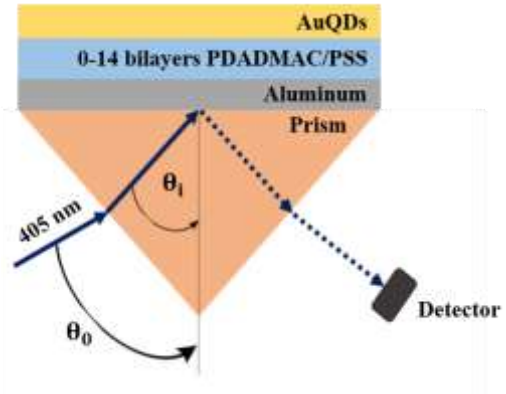

Fig. 1. SPR experimental configuration.

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