Fabrication of Gold Quantum Dots/Polyelectrolyte Layer-by-layer Ultrathin Films Studied by Surface Plasmon 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. Electrons in AuQDs are excited from the ground state to the excited state by absorbing mainly near-UV light. By using the quantum effect, the AuQDs have been applied for organic solar cells, biosensors and so forth.[1-2] Hence there is a great deal of interest in fabricating AuQDs ultrathin films. In this study, we fabricate AuQDs/polyelectrolyte layer-by-layer (LbL) ultrathin films. Poly(3,4-ethylenedioxythiophene): poly(styrene sulfonate) (PEDOT:PSS), poly(diallydimethylammonium chloride) (PDADMAC) and poly(sodium 4-styrenesulfonate) (PSS) were used as the polyelectrolyte layers. The fabrication process of layer-by-layer ultrathin films were monitored by surface plasmon resonance (SPR) spectroscopy. First, PDADMAC/PSS films were deposited mercapto propane sulfonate (MPS) functionalized silever films, then PDADMAC/AuQDs were deposited on the PDADMAC PSS films. The film structure with Kretschmann configuration is shown in Fig. 1. As shown in the SPR kinetic curve and angular scans during LbL deposition (Fig. 2), a monotonic increase in the SPR curve due to the adsorption of AuQDs on PDADMAC films were observed, indicating that the well ordered AuQDs/PDADMAC LbL ultrathin films were fabricated. Further studies such as fluorescence, AFM and UV-vis properties will be reported.

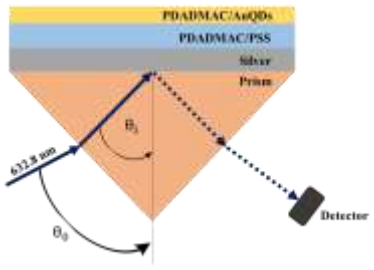

Fig. 1. SPR configuration for AuQDs/PDADMAC LbL film.

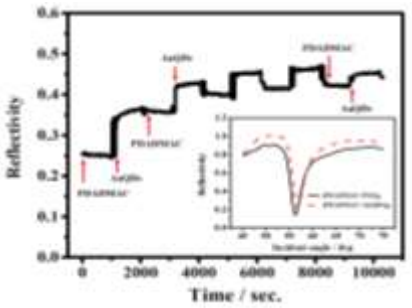

Fig. 2. SPR kinetic curve and angular scans during LbL deposition on Ag/glass substrate.

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