Fluorescence Studies of Semiconductor Nanoparticle Modified Electrodes

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Over the past decade there has been intense interest in the growth and characterization of colloidal suspensions of semiconductor nanoparticles. It has been demonstrated that such particles display novel physical and chemical properties as a result of the high surface area to volume ratio and the confinement of charge carriers. Recently methods have been developed in which arrays of semiconductor nanoparticles are formed on electrode surfaces. It has been demonstrated that the optical properties of the individual particles in such layers are maintained. Electrodes prepared using these techniques allow the optoelectronic properties of the nanoparticles to be probed.

In this paper a number of methods of depositing CdS nanoparticles on to optically transparent electrodes will be discussed. It will be shown that the nanoscale architecture obtained is highly dependent upon the methodology employed and the surfactant stabilising group tethered to the particles surface. The influence of the deposition procedure on the photoelectrochemical properties of the as-prepared electrodes will be rationalised.

Particular emphasis will be given to studies of the effect of applied potential on the fluorescent properties of the nanoparticle layers. It will be demonstrated that the luminescence signal is reversibly quenched when potentials are achieved at which electrons are injected in to the nanoparticles. The decrease in luminescence intensity at negative potentials will be discussed in terms of Auger annhilation of the exciton.