Preparation of CdS Nano-particles Emitting High Fluorescence

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Semiconductor nano-particles having a controlled size distribution are receiving great interests regarding their electronic and optical properties. For instance, the band gap emission can be tunable over wide wavelengths by adjusting an appropriate size of the particle. The particles prepared from such the viewpoint should be useful as a fluorescence agent for optical and biotechnological applications. Therefore, extensive studies have been conducted especially using CdSe particles. However, the current method for preparing size-controlled particles requires usually high-class techniques with severe reaction conditions.

Our research group has already developed a simple preparation method to produce mono-dispersed CdS nano-particles[1-3] that is called "size-selective photo-etching technique." This technique allows preparing the particles with a size distribution < 0.2 nm by just irradiating the starting CdS particles with monochromatic light as shown in Fig. 1 where absorption spectra of CdS nano-particles after irradiation with different wavelength lights are given.

In the present paper, we would like to report a novel method to prepare highly emissive CdS nanoparticles from the mono-dispersed CdS particles prepared by the size-selective photo-etching. The emission intensity is successfully enhanced by treating the CdS surface with an appropriate pH solution. As shown in Fig. 2, our method developed in this study makes it possible to produce CdS fluorescent agents of different wavelengths.

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References

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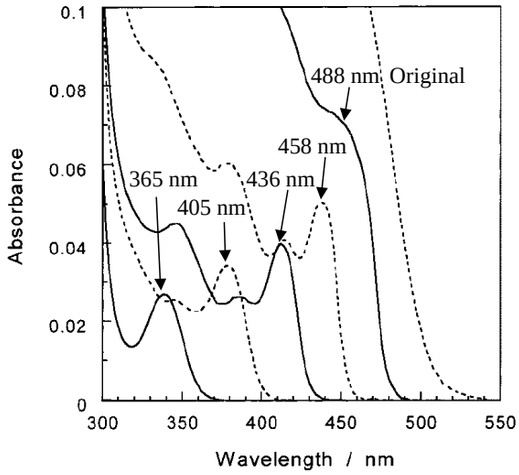

Fig. 1. Absorbance of CdS nano-particles after irradiation to the starting CdS particles with monochromatic lights of different wavelengths.

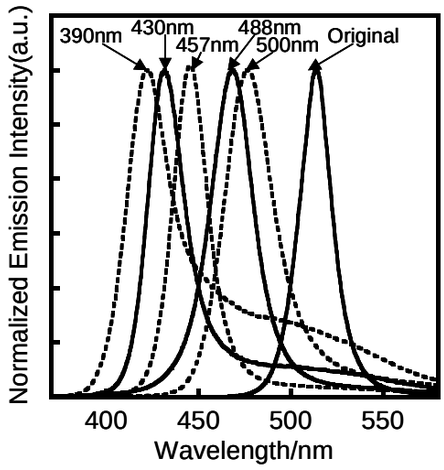

Fig. 2. Fluorescence spectra of CdS nano-particles after being subjected to size-selective photo-etching with different wavelengths and chemical treatments.