

講演題目 : Cadmium-free Colloidal Quantum dots

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問い合わせ : 化学工学専攻 田中祐圭



Quantum dots have unique properties which have been intensely studied for many promising technological applications. For example unique properties of semiconductor nanoparticles are ideally suited for fluorescence imaging. Advanced fluorescence imaging will provide a high-resolution means of detecting diseased cells; tracking nano-encapsulated drugs; and studying intracellular mechanisms. These semiconductor nanoparticles are commonly known as quantum dots - derived from the fact that decreasing the size of the nanoparticles introduces quantum confinement of the charge carriers leading to an increased band-gap. By tuning the size of the semiconductor one can therefore tune the emission wavelength. To date, the most studied semiconductor nanoparticles are cadmium-based (CdTe, CdSe, and CdS). These cadmium based quantum dots have excellent optical properties, stability, and monodispersity. However, increasing global restrictions and lack of biocompatibility of cadmium has lead to questions about the future of quantum dots for many applications. It is therefore essential that we investigate alternative quantum dot materials. We have focused our attention on the development of copper indium sulphide quantum dots, which have an ideal bulk band gap, lower toxicity, small size and ability to control surface functionality. The properties of these recently developed quantum dots are discussed in the context of biomedical imaging and the steps needed to reach this goal.