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Luminescence Temperature Anti-Quenching for CdSe and CdTe Quantum Dots

Andries Meijerink, S.F. Wuister and C. de Mello Donega,
Condensed Matter and Interfaces, Debye Institute
Utrecht University, Princetonplein 5, 3584 CC Utrecht

The present popularity of everything that involves 'nano' has contributed to the rapid increase of research on the luminescence of nanocrystalline semiconductor particles. In the case of nanocrystalline semiconductors the present nanohype is a valid excuse to increase the chances for funding and the money is used to do exciting new physics and chemistry. The quantum size effects that occur in nanocrystalline semiconductors (also called quantum dots, QDs) are responsible for a change in the electronic structure in the nanocrystals as a function of particle size. This results in fascinating size dependent optical and electrical properties. The unique size dependent properties are not only of great fundamental interest but also offer possibilities for applications of quantum dots.

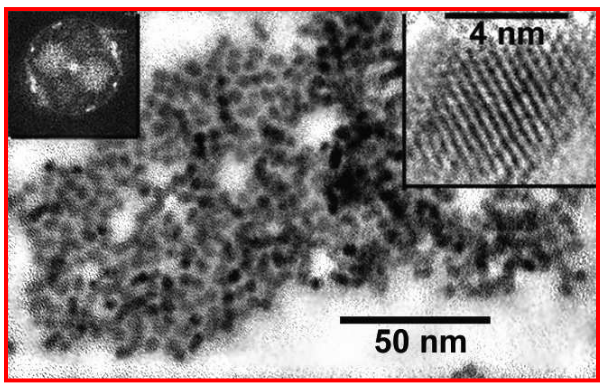

Fig. 1 - TEM image of CdSe quantum dots.

The luminescence efficiency of quantum dots depends critically on the surface passivation. The subtle influence of the surface capping layer is illustrated by the quenching of the luminescence as the quantum dots are cooled. This is a unique phenomenon as in any other system the luminescence quenches upon heating (temperature quenching of luminescence). The temperature anti-quenching of luminescence that is observed for CdSe and CdTe quantum dots is related to subtle changes in surface layer of the quantum dot.

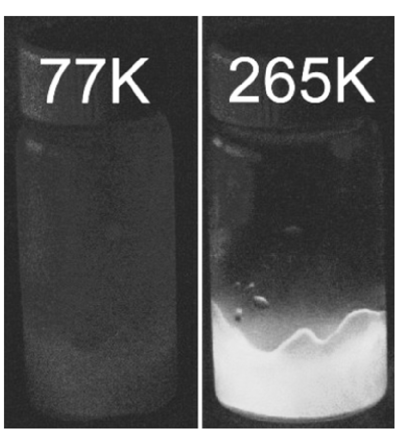

Fig. 2 - Illustration of the temperature anti-quenching effect for CdTe quantum dots in water.