From non-toxic quantum dots to light displays

Souad AMMAR - *Université de Paris Cité, France*

The development of a light-emitting capacitive device, based on manganese doped zinc sulfide nanoparticles (NPs) and operating under AC voltage, is addressed. The involved luminescent NPs were synthesized in solution without the use of any surfactant by a microwave assisted heating. Interestingly, they evidenced an enhancement of their optical activity under prolonged UV-light exposition due to surface oxidation induced local lattice-strain effects around manganese chromophores. These NPs were subsequently deposited by spin coating as a single layer sandwiched between two insulating thin films. Hafnium oxide film deposited by atomic layer deposition (ALD) was chosen to form the required dielectric barriers. The main characteristics of the complete electroluminescent were then collected. More specifically, the manganese-induced orange emission was recovered within a typical threshold behaviour of the intensity of the emitted light as a function of the applied voltage. By exploiting structural characterization, impedance spectroscopy measurements and a careful comparison with theoretical works on similar devices, we have been able to state that the mechanism behind the observed light emission is a field-induced charge-creation process within the active layer only, followed by charge transport across the layer and radiative recombination within single nanoparticles. Compared to the previous works based on such kind of QD-based AC electroluminescent devices, those produced here offer the opportunity to replace toxic cadmium selenide or cadmium telluride QDs by almost soft ZnS:Mn ones, taking advantage of their UV photoactivation to improve their final quantum yield.