Composite supraparticles with tunable white light emission

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Semiconductor nanocrystals (NCs) have recently emerged as a very promising material with many different technological applications. In particular, the use of these particles as light emitters attracts more and more interest. One of the greatest challenges in this respect is the realization of highly efficient white light emitting particles. For instance, the literature reports white light emitters with very low quantum efficiency and a badly tunable emission spectrum, far away from a broad technological application.

To fill this gap we realized a new class of highly efficient white light emitting supraparticles (SPs), characterized by a highly controllable and tunable emission spectrum and excellent synthesis reproducibility. Supraparticle synthesis is based on the mixed self-assembly of red, green and blue emitting nanocrystals into a 3D spherical supraparticles by an oil-in-water microemulsion method [1,2]. We are able to accurately control the supraparticle size from a few hundred nanometers to some micrometers. The emission of the supraparticles can be rationally tuned by simply mixing different proportions of blue, green and red emitting nanocrystals [Fig. 1].

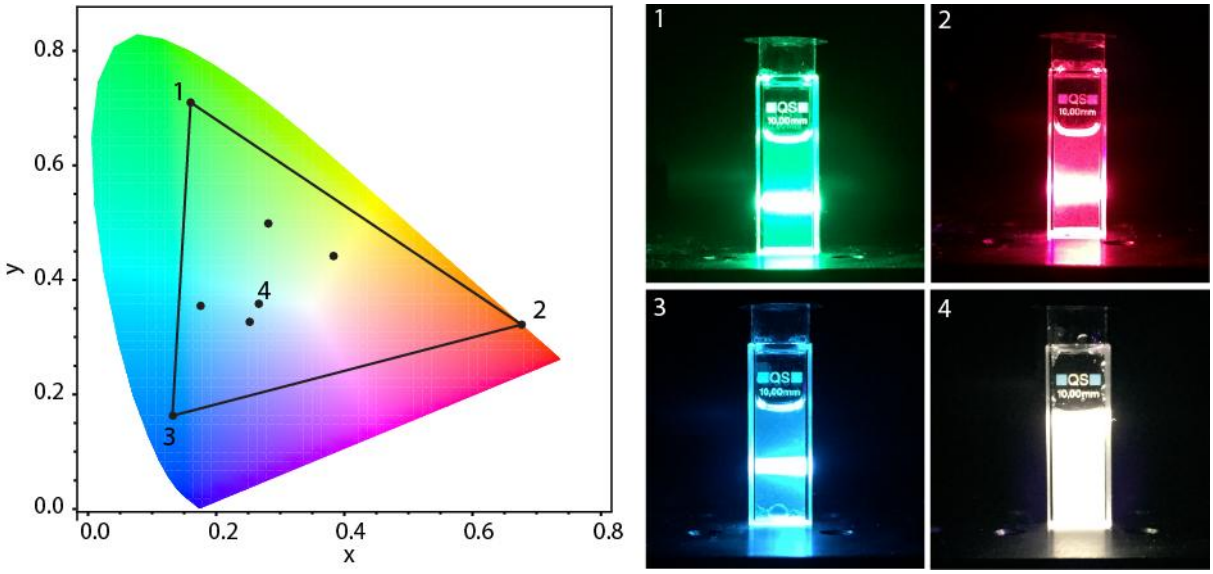

Fig. 1 left) CIE chromaticity diagram showing the coordinates of the NCs and of the SPs; right) Digital photographs of the solutions of NCs (1-3) and of the SPs (4)

Our work presents a platform for easily processable colloidal particles with a bright and stable (non-blinking) emission, with primary or composed colours, tunable in the entire visible range. These supraparticles hold promise as phosphors for lighting, displays, as well as in biology research. In this talk we will give a comprehensive presentation of these intriguing supraparticles, illustrating the synthesis method as well as the optical properties that make them so appropriate for lighting applications [3].

[1] de Nijs et al., *Nat. Mat.*, **2015**,14, pp 56-60
[2] Vanmaekelbergh et al., *ACS Nano*, **2015**, 9 (4), pp 3942–3950.
[3} F. Montanarella et al., submitted.