Carbon dots suspensions synthesis: study of process parameters based on physicochemical and optical characteristics of nanoparticles.

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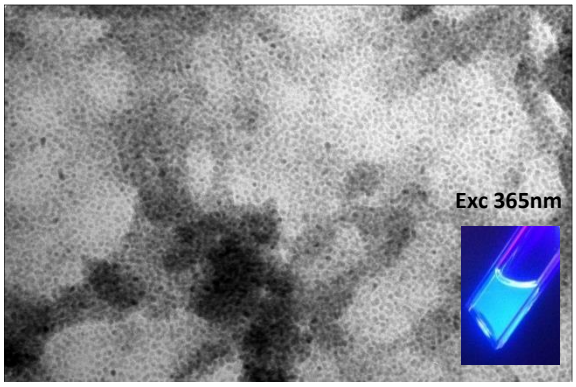

Microwave synthesis of Cdots using polyols

- Large scale production of fluorescent carbon nanoparticles "Cdots" in suspension
- Stable and concentrated suspension
- Easily recoverable and modifiable nanoparticles (oxide/Cdots hybrids)

Abstract:

Accidentally discovered in 2004, carbon dots are carbon nanoparticles possessing remarkable luminescent properties including fluorescence, making them suitable for low-cost and eco-friendly light emitting devices and serious competitors to quantum dots. During the last decade, they attracted a growing interest from scientists and syntheses have been multiplied. The most widely used method is soft chemistry synthesis based on dehydration of carbohydrates that have O,H,N…elements in their structure. These elements play a key role on physicochemical and optical properties of the obtained carbon dots, especially on fluorescence which origin is still discussed. All reported syntheses are easy to implement and well mastered. However, they are all done at laboratory scale and almost never on pilot or industrial scale. In addition, the reported methods used to recover nanoparticles (dialysis, chromatography column…) are time consuming and may include multiple steps discouraging large scale production.

In this work, we try to set up a synthesis process of carbon dots with tunable luminescent properties depending on their chemical composition. This process should also allow the easy retrieval of the nanoparticles and a larger scale production. The chemical system envisioned for this process consists of oxides/carbon dots hybrids, where the carbon dots are distributed in a transparent oxide matrix (silica…) making parametrical studies: UV absorption, TEM, EDX, FTIR..etc easier. These studies will enable us to relate the optical and physical properties of the carbon dots to their chemical composition and then validate the most relevant chemical systems. Once the synthesis in laboratory scale is optimized and the chemical system chosen, the process will be scaled up for a larger production.