XXI Brazilian Meeting on Inorganic Chemistry
X Brazilian Meeting on Rare Earths
III Workshop on Theoretical Bioinorganic Chemistry
Belo Horizonte, September 12 - 15th 2024

Glow on-the-go: Tracking CdTe Quantum Dots Luminescence in Real-time

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Thematic Area: Material Chemistry

Keywords: *in situ* monitoring, quantum dots growth, cadmium telluride

Luminescent materials have been explored across a variety of applications due to their versatility. Quantum Dots (QDs) are a type of luminescent nanomaterial that possesses unique optical characteristics due to the quantum confinement effect. QDs are high-efficiency semiconductors with dimensions ranging from 2 to 10 nm, featuring a high surface-volume ratio and spectral tunability [1,2]. The optical properties of QDs are directly correlated with their size, thus real-time monitoring of their growth during synthesis enables the development of QDs with specific size and luminescence characteristics. In this study, a novel approach was employed to monitor the luminescence of CdTe QDs in aqueous solution up to 90 °C, through *in situ* luminescence analysis [1,3]. This technique allowed for a detailed examination of the evolution of light emission from the QDs during their growth (Fig. 1a). Compared to *in situ* absorbance analysis, *in situ* luminescence measurements in reflection geometry are particularly advantageous as they are not affected by the increase in concentration of the colloidal suspension. Three reactions were monitored at temperatures of 70, 80, and 90 °C, resulting in QDs with maximum emission wavelengths centered at 550, 600, and 655 nm, respectively, and average sizes of 2, 3, and 4 nm (Fig. 1b). The reaction time was set at 3 hours, resulting in a total of 90 spectra for each temperature. *In situ* monitoring proved effective in allowing the adjustment of QDs emission color for desired applications, even for very small differences in particle size.

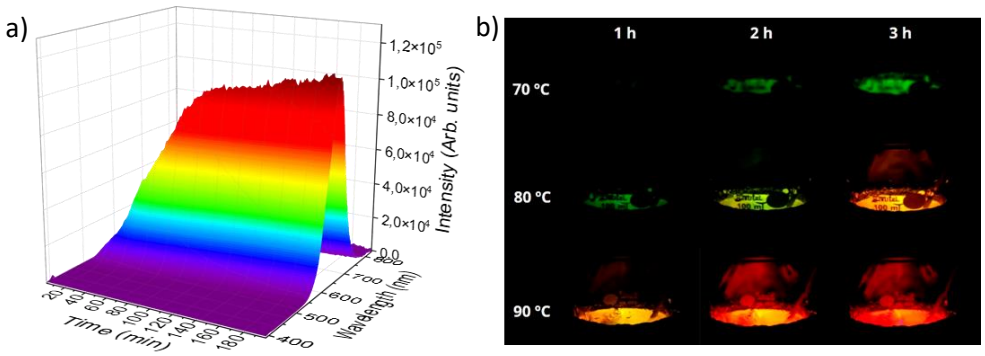

Figure1. a) Luminescence spectra from *in situ* monitoring and b) emission color of CdTe QDs at temperatures of 70, 80, and 90 °C every 60 minutes over a period of 3 h.

Acknowledgments: The authors gratefully acknowledge the support of FAPESP and CNPq.

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