

244 Spectroscopic study of cadmium Quantum Dots biosynthesized by *Escherichia coli* using taurine as sulphur source.

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Generation of cadmium sulphide (CdS) quantum dots (QDs) using *E. coli* cultures is a novel and promising alternative to traditional methods of synthesis. This phenomenon depends of the sulphide sources used in the process [1]. To date, no synthesis has been reported using taurine as sulphur source. Based on this, we report the characterization of CdS QDs synthesized using taurine as the main sulphur source by *E. coli* cultures.

In the present work we evaluated the changes in culture fluorescence during cadmium incubation as a preliminary screening for NPs formation [2]. A color change from green to red in pellets fluorescence was detected after 12 h incubation indicating the generation of cadmium based QDs as reported before [2].

Afterward, we performed a multispectral confocal microscopic analysis in order to evaluate the location and *in situ* properties of the NPs. An intense green fluorescence emission in both poles of *E. coli* cells treated during 10 h with cadmium was found indicating the intracellular formation of QDs. Finally, *in-situ* fluorescence spectrum analysis was determined and reported for biosynthetic cells for the first time. Interesting, a maximum emission wavelength (λ_{em}) of 500 nm is reported confirming the biosynthesis screening. Finally, Fig. 1a shows the absorbance spectrum of NPs purified from bacterial cells. A smooth disturbance in the range of 350-390 nm correlate with the plasmonic behavior described for biosynthesized CdS QDs [2]. Furthermore, fluorescence emission spectrum (Fig. 1b) shows a λ_{em} at 500 (green) and 540

(orange) nm for samples incubated with cadmium for 10 and 24 h, respectively. The change in the λ_{em} confirms the size growth of the NPs, a classical behaviour characterizing QDs. Additionally, the maximum excitation wavelength (λ_{ex}) do not vary in an incubation-time depending form, which is also characteristic of QDs.

Based in these results we confirmed the generation of Cd QDs using taurine by *E. coli*, demonstrating the potentiality of taurine as sulphur source during biological synthesis of NPs of different colours.

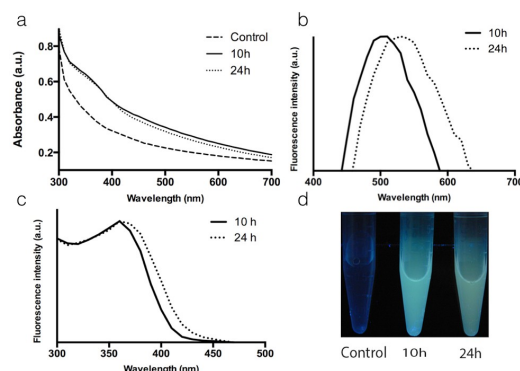


Fig. 1 Spectroscopic characterization of biosynthesized cadmium fluorescent NPs. **1a.**, Absorbance spectrum of biosynthesized NPs incubated after 10 and 24 h with cadmium. **1b.**, Emission fluorescence spectrum of biosynthesized NPs after 10 and 24 h of cadmium incubation. **1c.**, Excitation fluorescence spectrum of biosynthesized NPs. **1d.**, Biosynthesized NPs after 0 (control), 10 and 24 h of metal incubation excited at 365 nm.

[1] Mandal, D., Bolander, M. E., ... & Mukherjee, P. Appl Microbiol Biotechnol. **69**, (2006).

[2] Monrás, J. P., Díaz, V., ... & Pérez-Donoso, J. M. PloS one. **7**, e48657, (2012).