Hydrophilic Ag_2Se Quantum Dots Fluorescence Enhancement by Photoactivation

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Quantum dots (QDs) had a significant impact on biological and medical applications, and their importance is still growing, mainly due to their high photostability, small size, and chemically active surface. Between these nanocrystals of semiconductors, I-VI QDs have been arising as promising materials, both for their intrinsic properties and the absence of heavy metals in their composition. Silver chalcogenides show promising potential for biological applications due to their less cytotoxicity, emission ranging between the red and near-infrared spectral region, which is considered the "biological diagnosis window" (650-1450 nm), and higher penetrability in biological tissues, boosting their applications *in vivo*.[1,2] However, the aqueous synthesis of silver chalcogenides affords QDs with lower quantum efficiency, when compared to the preparation in organic solvents.[1] Thus, this work was the goal of enhancing the fluorescence intensity of hydrophilic silver selenide (Ag_2Se) QDs. Ag_2Se QDs were prepared in water, using mercaptosuccinic acid as stabilizing agent, at 70 ºC, and pH = 5. The QDs' optical properties were monitored by absorption and fluorescence spectroscopies, and their emission was enhanced using visible light irradiation. The prepared Ag_2Se presented an emission maximum at 750 nm with a full width at half maximum (FWHM) of 143 nm (Figure 1A). Our results showed that 30 min of irradiation induced an emission redshift as well as enhanced the QDs emission up to 500 % and reduced the FWHM to 95 nm (Figure 1B), without any changes in their absorption spectrum. Thus, photoirradiation can be a good strategy to improve silver chalcogenides' quantum yields.

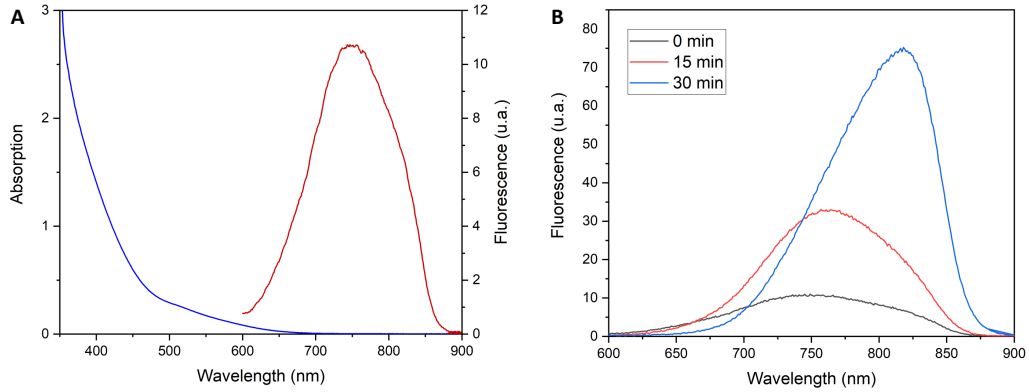

Figure 1. (A) Absorption and emission spectra of Ag_2Se after synthesis. (B) Fluorescence spectra of Ag_2Se after irradiation.

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References

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