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**Silver Quantum Dot Decorated 2D-SnO2 Nanoflakes for Photocatalytic Degradation of the Water Pollutant Rhodamine B**

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**Abstract**

Decoration of 2D semiconductor structures with heterogeneous metal quantum dots has attracted considerable attention due to advanced optical, electrical, and catalytic properties that result from the large surface-to-volume ratio associated with these structures. Herein, we report on silver quantum dot decorated 2D SnO2 nanoflakes for the photocatalytic abatement of water effluents, the synthesis of which was achieved through a straightforward and mild hydrothermal procedure. The photocatalysts were systematically investigated using UV–Vis, XRD, electron microscopy (SEM, HR-TEM), EDX, XPS and FTIR. The photocatalytic activity of the nanostructures was evaluated for the abatement of water pollutant rhodamine B (RhB), under light irradiation. The mild hydrothermal synthesis (100 °C) proved highly efficient for the production of large scale Ag quantum dot (QD)/SnO2 nanoflakes for a novel photocatalytic application. The decoration of SnO2 with Ag QDs significantly enhances the synergetic charge transfer, which diminishes the photo-induced electron-hole reunion. Moreover, the plasmonic effect from Ag QDs and 2D-SnO2 structures acts as an electron tank to collect the photo-induced electrons, generating a Schottky barrier between the SnO2 structures and quantum dots. Overall, this resulted in a facile and efficient degradation of RhB, with a rate double that of pristine SnO2.

**Keywords:**

[Silver quantum dots](https://www.mdpi.com/search?q=silver%20quantum%20dots), [2D-SnO2 nanoflakes](https://www.mdpi.com/search?q=2D-SnO2%20nanoflakes), [photocatalytic activity](https://www.mdpi.com/search?q=photocatalytic%20activity), [rhodamine B](https://www.mdpi.com/search?q=rhodamine%20B)

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