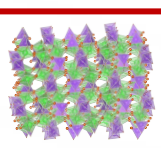
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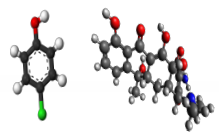
Visible-light-driven photocatalytic reactions promoted by oxygen-deficient $Al_2W_3O_{12}$ nanopowders for the degradation of persistent pollutants

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Introduction

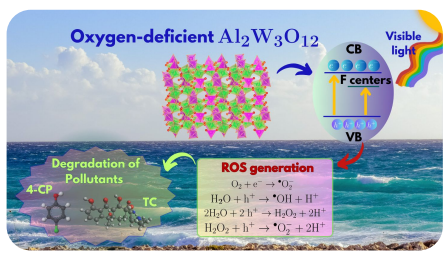




- The **degradation** of **persistent pollutants**, such as **tetracycline (TC)** and **4-chlorophenol (4-CP)**, *via* **visible-light photocatalysis** remains a **challenge** due to its high stability [1].
- **Aluminum tungstate** ($Al_2W_3O_{12}$), has stood out for its **low synthesis cost** and **high thermal** and **chemical stability** [1, 2].
- $Al_2W_3O_{12}$ have shown its **photocatalytic potential** under **UV** [3].
- **Oxygen vacancies** emerge as a strategy to **extend** the **response to visible light** and **improve photocatalytic performance** [1, 2].

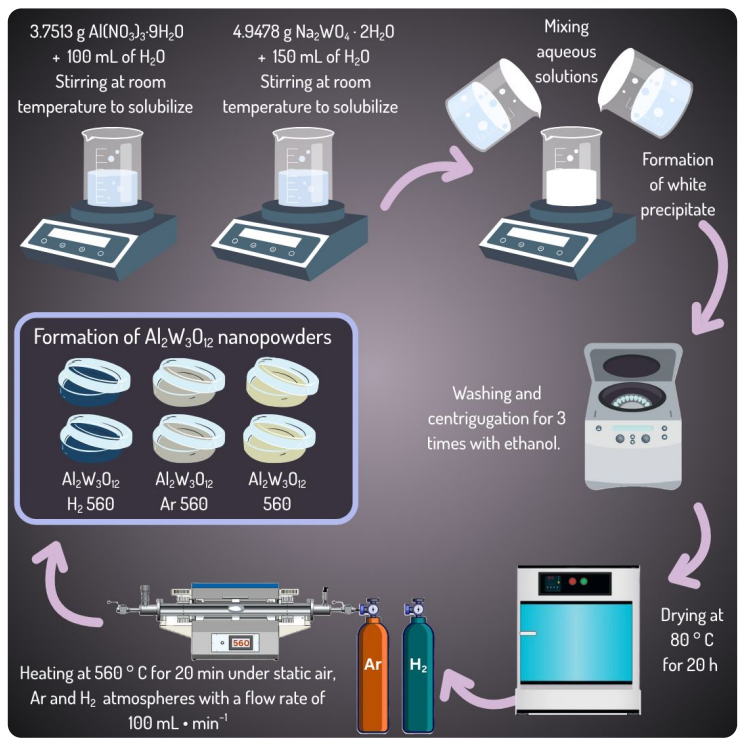
Objective

To investigate the influence of **oxygen vacancies** on the **optoelectronic properties** and **photocatalytic activity** of $Al_2W_3O_{12}$ **nanopowders** for the **degradation** of **TC** and **4-CP** under **visible light** irradiation.



Methodology

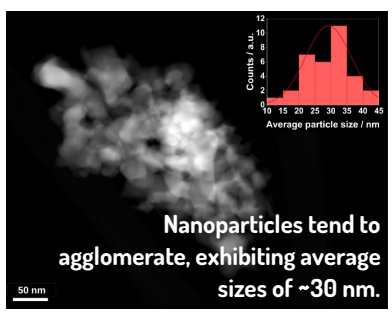
Synthesis *via* co-precipitation

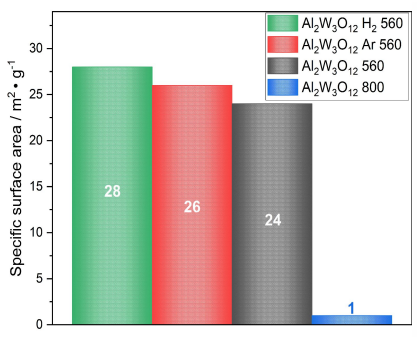


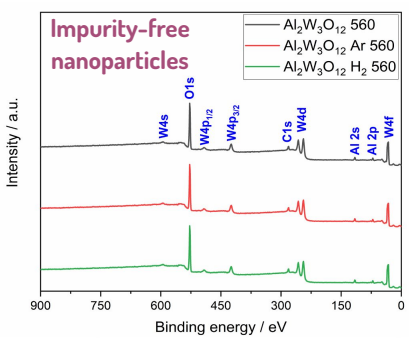
Characterization techniques

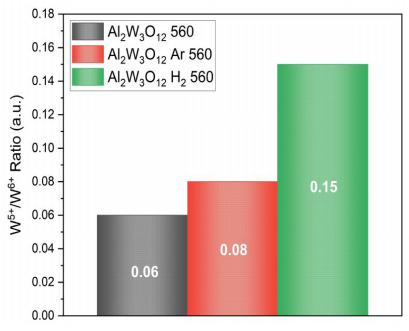
XRPD	XPS	N_2 adsorption
TGA / DSC	EPR	Photocurrent
TEM	FTIR	Photocatalytic test
DRS	PL	EIS, Mott-Schottky

Results and Discussion









Ionic compensation process

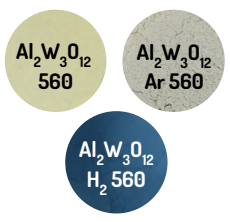
$$O_O^{\times} \rightleftharpoons V_O^{\bullet\bullet} + \frac{1}{2}O_2(g) + 2e',$$

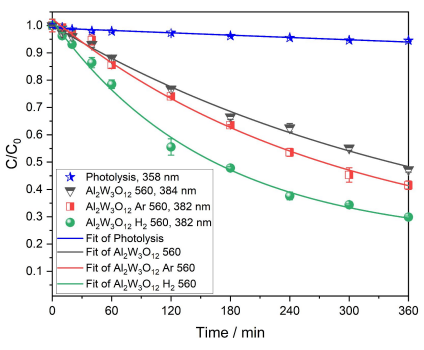
$$O_O^{\times} + 2W_W^{\times} \rightleftharpoons V_O^{\bullet\bullet} + 2W_W' + \frac{1}{2}O_2(g).$$

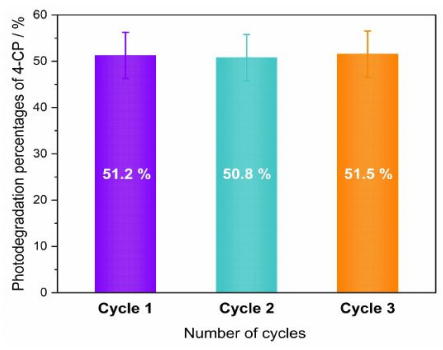
$$O_O^{\times} \rightleftharpoons V_O^{\bullet} + \frac{1}{2}O_2(g) + e',$$

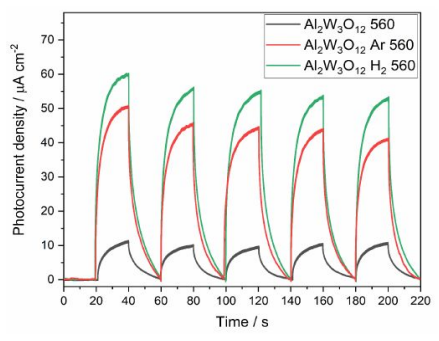
$$O_O^{\times} + W_W^{\times} \rightleftharpoons V_O^{\bullet} + W_W' + \frac{1}{2}O_2(g).$$

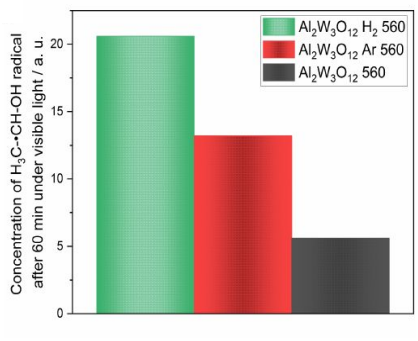
Visible-light sensitization











Conclusions

- The introduction of **oxygen vacancies** promoted **visible-light sensitization** and **charge carrier separation**.
- **Increasing** the **concentration** of **oxygen vacancies** led to **higher degradation efficiency** for **TC** and **4-CP**.
- **Photogenerated holes** and **•OH** were the **main reactive species** involved in the degradation.

References and Acknowledgments

[1] GIL-LONDOÑO, J. *et al. Ind. Eng. Chem. Res.*, v. 64, n. 23, p. 11291–11306, 2025. DOI: 10.1021/acs.iecr.5c01399.
[2] GIL-LONDOÑO, J. *et al. J. Phys. Chem. C*, v. 129, n. 5, p. 2649–2662, 2025. DOI: 10.1021/acs.jpcc.4c06098.
[3] MIRSADEGHI, S. *et al. Colloids Surf. A: Physicochem. Eng. Aspects*, v. 586, p. 124254, 2020. DOI: 10.1016/j.colsurfa.2019.124254.

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