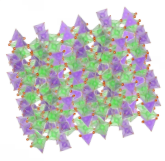
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$Al_2W_3O_{12}$-based heterojunctions and co-catalysts for photocatalytic H_2 production under visible light radiation

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Introduction

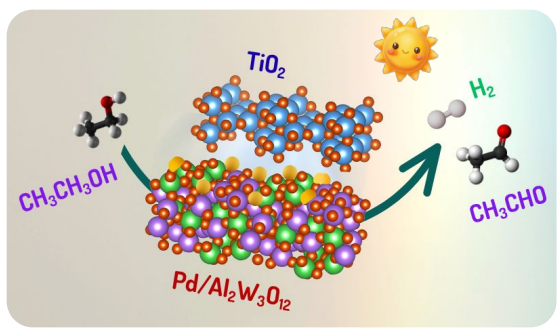




- Photocatalytic **H_2 production** under **solar radiation** requires materials a**ctive in** the **visible region** of the spectrum.
- **TiO_2** is widely used in photocatalysis. However, its **wide bandgap** limits visible light absorption [1].
- **Aluminum tungstate** ($Al_2W_3O_{12}$) has stood out for its low synthesis cost and **high thermal** and **chemical stability** [2].
- Although **$Al_2W_3O_{12}$** had not been explored for photocatalytic H_2 production, our previous studies have demonstrated that **structural modifications** can **confer photocatalytic activity** under **visible light** radiation [2, 3].

Objective

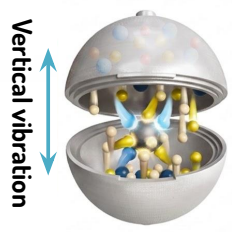
To investigate the optoelectronic properties and **photocatalytic activity** of **$Al_2W_3O_{12}$-based heterojunctions** and **co-catalysts** for **H_2 production** under **visible light radiation**.



Methodology

$Al_2W_3O_{12}$ nanoparticles were synthesized *via* co-precipitation and thermal treated under H_2 atmosphere at 560 °C.

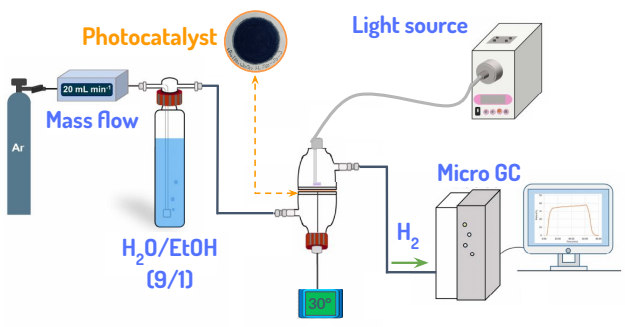
Synthesis of co-catalyzed systems and heterojunctions *via* ball milling



- $Al_2W_3O_{12}$ H_2 560
- TiO_2 -> 5 %, 10 %, 15 % and 20 %wt.
- Au, Pt or Pd -> 1 %wt.

Milling parameters: 10 min, BPR of 45 and frequencies: 15 - 40 Hz.

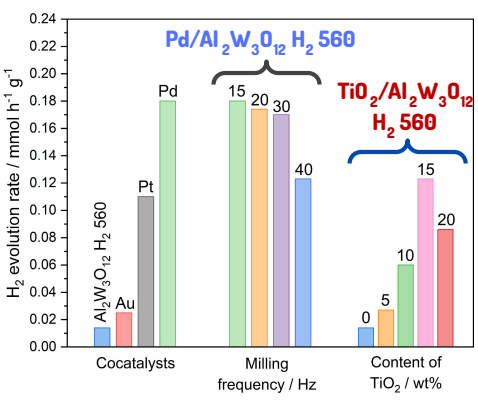
Setup for photocatalytic H_2 production

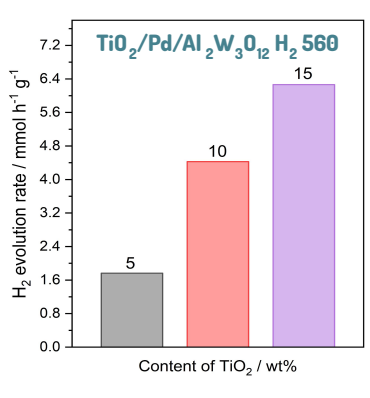


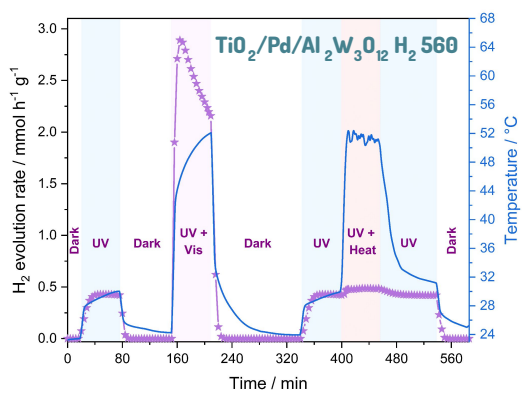
Characterization techniques

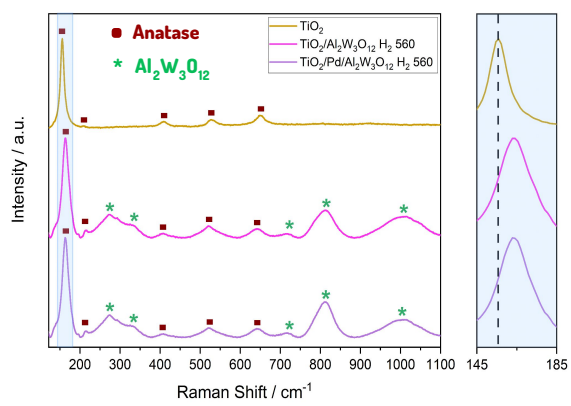
XRPD	XPS	EPR
DRS	Raman	EIS and Photocurrent
TEM	PL	Photocatalytic test

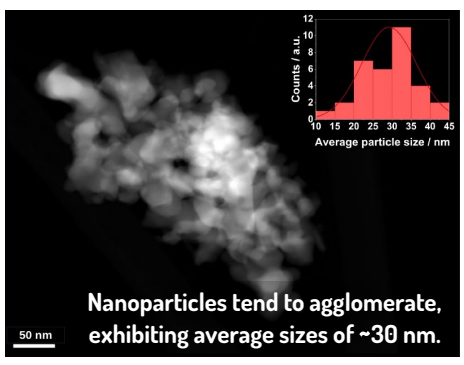
Results and Discussion

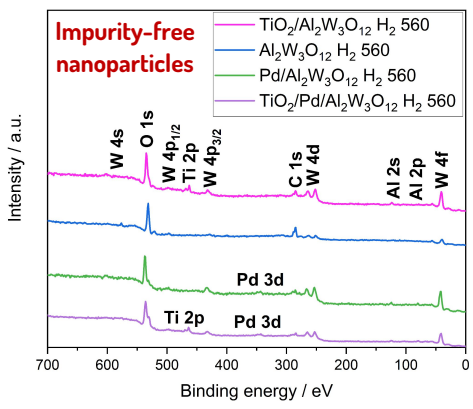


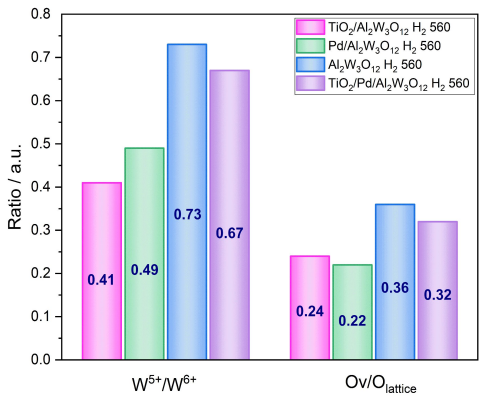


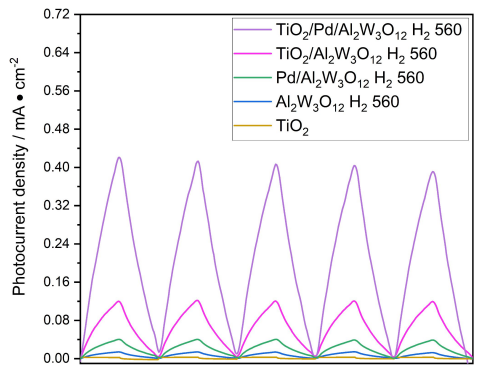












Conclusions

★ **Heterojunctions** and **noble-metal** used as **co-catalysts improved** photocatalytic **hydrogen production** in **$Al_2W_3O_{12}$-based nanostructures**.

★ The **superior performance** under **visible light** highlighted the **potential** of the proposed **modifications** for **harnessing solar radiation**.

★ The **findings demonstrated** the **potential** of **$Al_2W_3O_{12}$** as a **platform** for developing **hybrid photocatalysts** for the **sustainable H_2 production.**

References and Acknowledgments

[1] CHEN, Y. *et al. Appl. Catal. B Environ.*, v. 309, p. 121275, 2022. DOI: 10.1016/j.apcatb.2022.121275.
[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] GIL-LONDOÑO, J. *et al. Ind. Eng. Chem. Res.*, v. 64, n. 23, p. 11291–11306, 2025. DOI: 10.1021/acs.iecr.5c01399.

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