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Biomass-derived mesoporous silica for sustainable flavoring production using alternative technologies.

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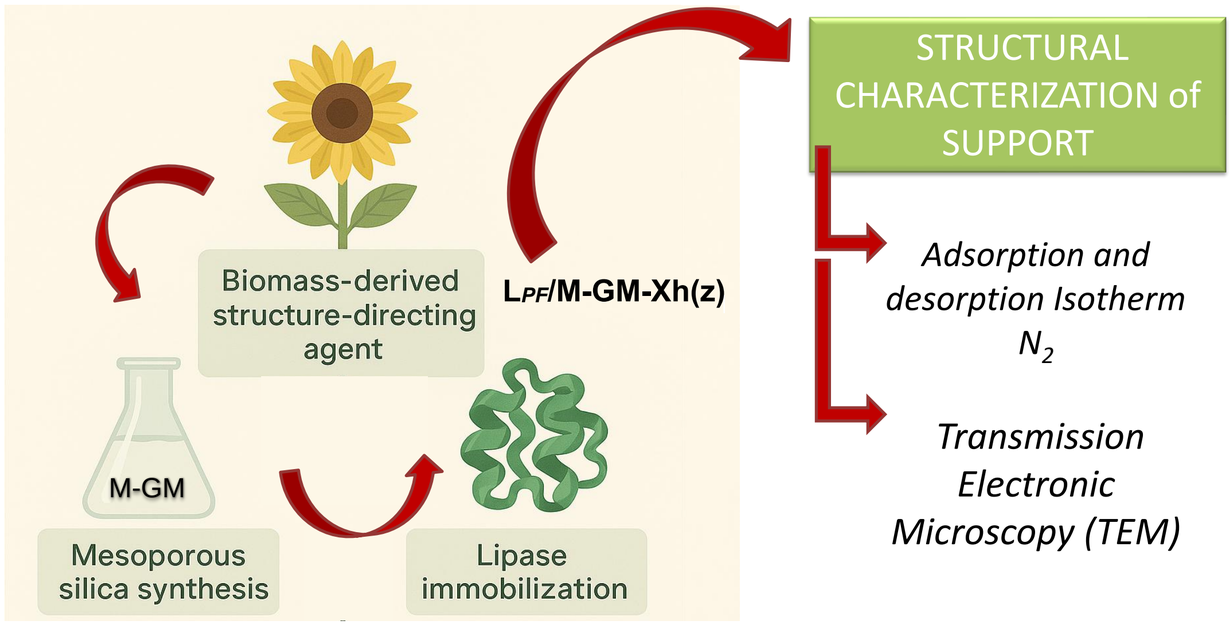
INTRODUCTION & AIM

The long-term environmental impact of chemical production urges the development of sustainable alternatives. We presents the synthesis of a mesostructured silica using a renewable, biomass-based molding agent, aimed at supporting enzyme immobilization for eco-friendly ester synthesis.

Objective: To produce isoamyl acetate, a banana-flavored compound widely used in the fragrance industry, through solvent-free biocatalysis under mild conditions (40 °C, atmospheric pressure) using alternative technologies.

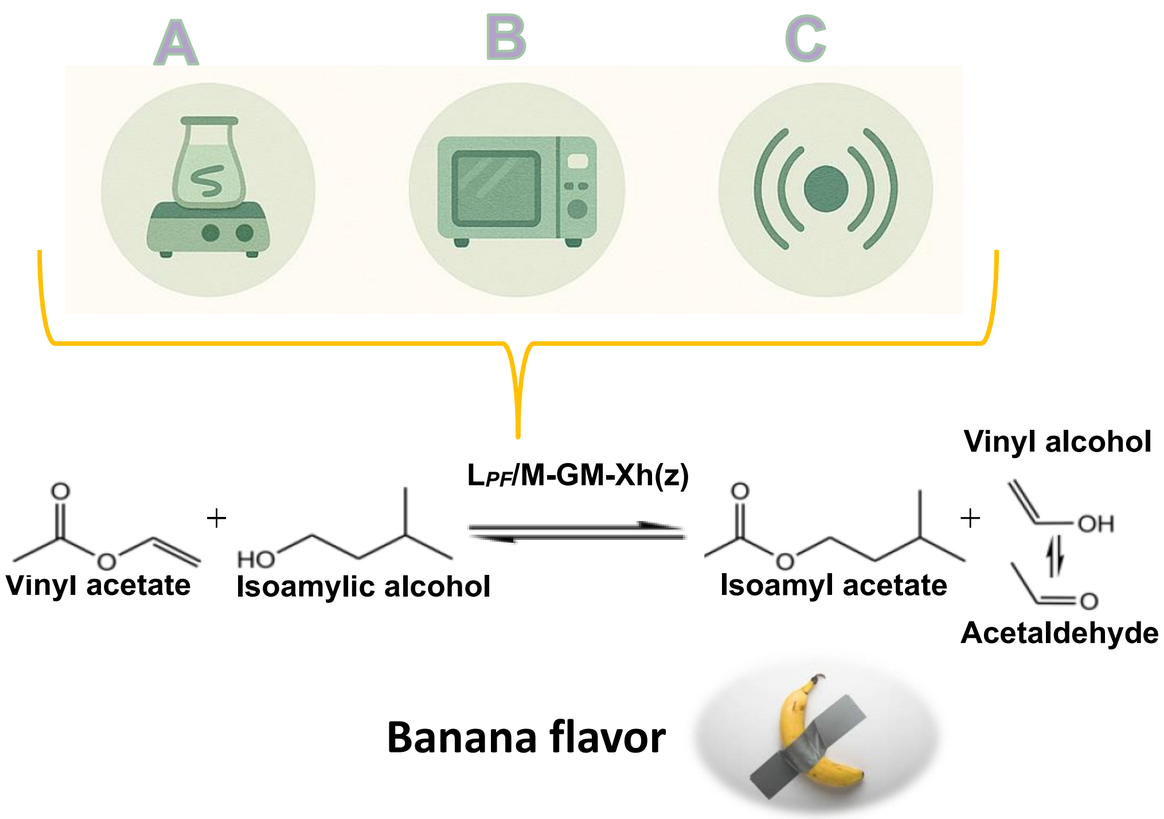
METHOD

Synthesis of materiales and characterization



Catalytic evaluation

The activity of biocatalyst to produce isoamyl acetate was evaluated in the transesterification of vinyl acetate with isoamyl alcohol in three systems**:** thermostated orbital shaker (A), microwave reactor (B) and ultrasound (C).



RESULTS & DISCUSSION

The siliceous material synthesized by sol-gel showed mesoporosity evidenced by physisorption N_2 isotherm and confirmed by TEM **(Fig 1)**.

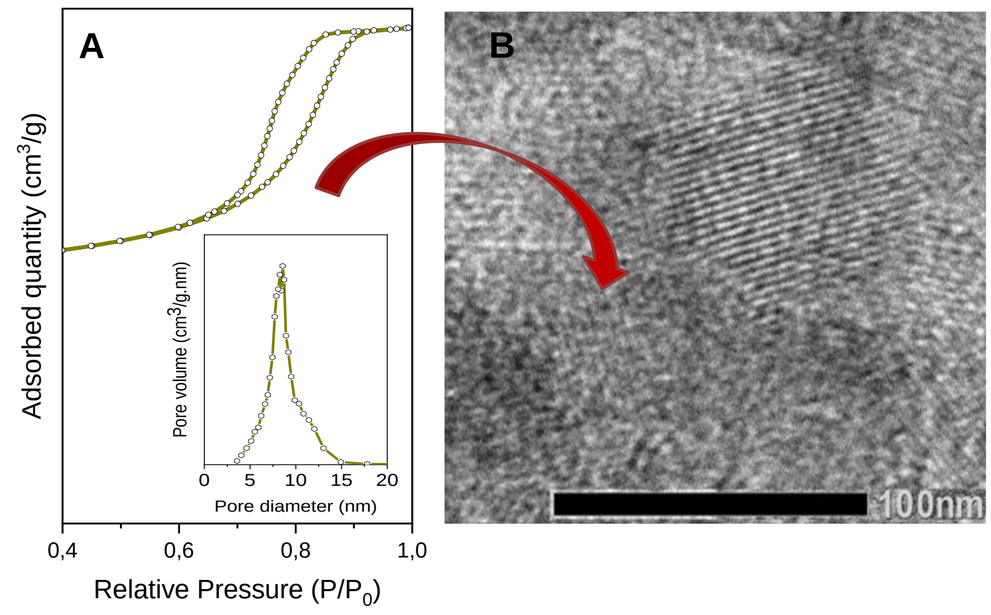


Fig. 1. *M-GM synthetized support: N_2 adsorption and desorption isotherm (A) and TEM (B).*

Lipase from *Pseudomonas fluorescens* was immobilized onto the M-MG material to develop a heterogeneous biocatalyst for the sustainable production of isoamyl acetate. The best performance was achieved in the using the ultrasound system with an immobilization time of 96h and a nominal load of 400 $mg_{enzyme}/g_{support}$ **(Fig 2).**

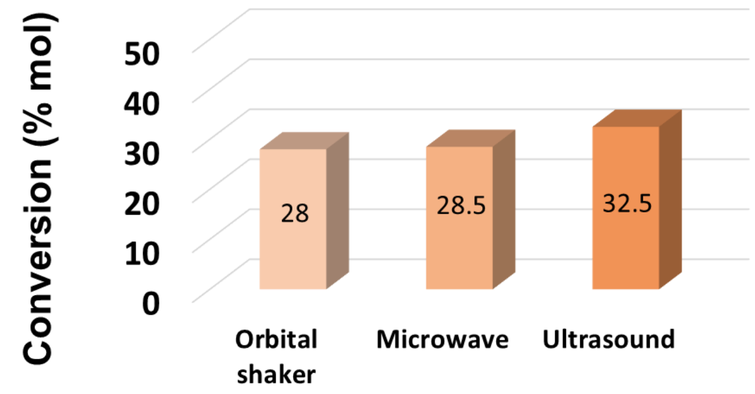


Fig. 2. *Catalytic performance in the three reaction systems (2 h).*

CONCLUSIONS

- A mesoporous support was successfully synthesized using a renewable templating agent.
- It was posible to immobilize the L_{PF} on the support and produce isoamyl acetate in all systems reactions tested. Being L_{PF}/M-GM(96-400) the most active, with the highest conversion at 2h on an ultrasounds system.

FUTURE WORK / REFERENCES

-Evaluate the use of other directing agents to find the characteristics of silica materials most suitable for lipase immobilization.
-Optimize the reaction conditions: Reaction temperature, molar ratio reactants.
-Combine other alcohols with vinyl acetate to obtain a family of flavors used in fine chemicals.