Advancing green chemistry: A tandem catalyst for efficient biomass conversion

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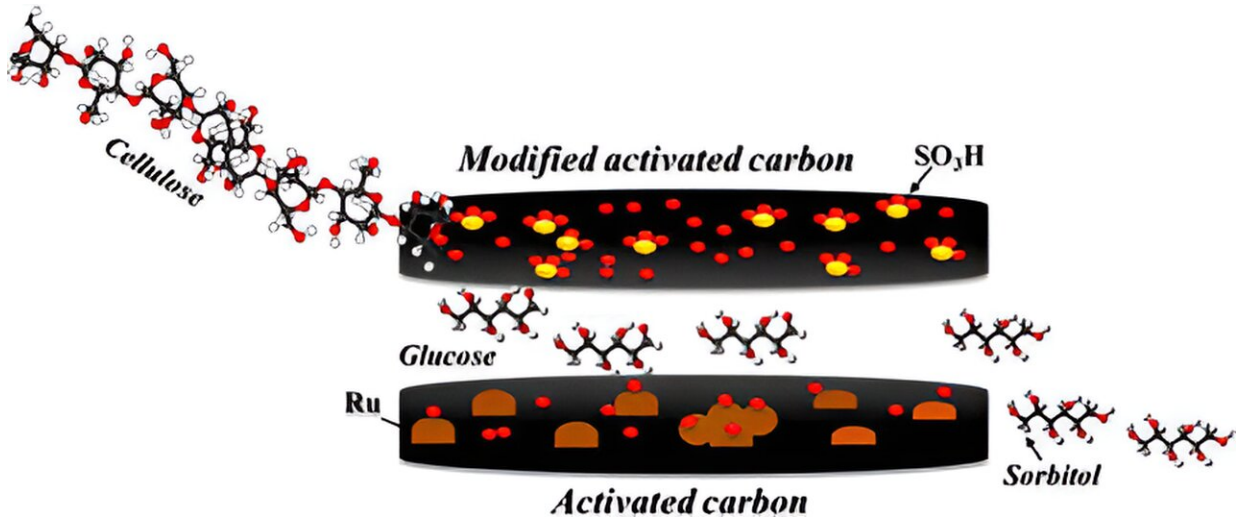

Researchers unveil a novel tandem catalyst approach to selectively convert biomass waste into valuable chemicals, marking a significant step towards sustainable biofuel production. Credit: Department of Inorganic Chemistry and Materials Institute, Faculty of Sciences, University of Alicante

The global demand for sustainable energy sources has intensified the search for environmentally friendly alternatives to fossil fuels. Biomass waste, a byproduct of various industrial processes, presents an untapped potential for the production of biofuels and bio-additives. However, the conversion of biomass into useful chemicals has been hindered by inefficiencies in existing catalytic processes.

A study, published in the *Journal of Bioresources and Bioproducts* and led by Fatima-Zahra Azar from the University of Alicante and Haichao Liu from Peking University, introduces a tandem catalyst system designed to overcome these challenges. The system comprises a solid acid catalyst, which promotes the hydrolysis of biomass, and a supported metal catalyst, responsible for the hydrogenation process.

In their experiments, the researchers utilized two types of functionalized activated carbons and the resin Amberlyst 15 as solid acid catalysts. The metal catalyst component consisted of Ru nanoparticles supported on the original activated carbon. The tandem catalysts demonstrated superior activity compared to the supported Ru catalyst alone.

The results showed that the highest cellulose conversion and selectivity to sorbitol were achieved using a novel tandem catalyst, which was a physical mixture of sulfuric acid-modified activated carbon and Ru-loaded activated carbon. This catalyst not only proved to be reusable but also offered a cost-effective and sustainable approach to biomass conversion.

The findings underscore the potential of the tandem catalyst approach in the green production of high-added-value chemicals. This innovative method aligns with the growing global focus on sustainability and offers a promising pathway for the valorization of biomass waste.

More information: Fatima-Zahra Azar et al, Selective biomass conversion over novel designed tandem catalyst, *Journal of Bioresources and Bioproducts* (2024). DOI: 10.1016/j.jobab.2024.09.001

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