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Integrating Hydroformylations into a Methanol Economy

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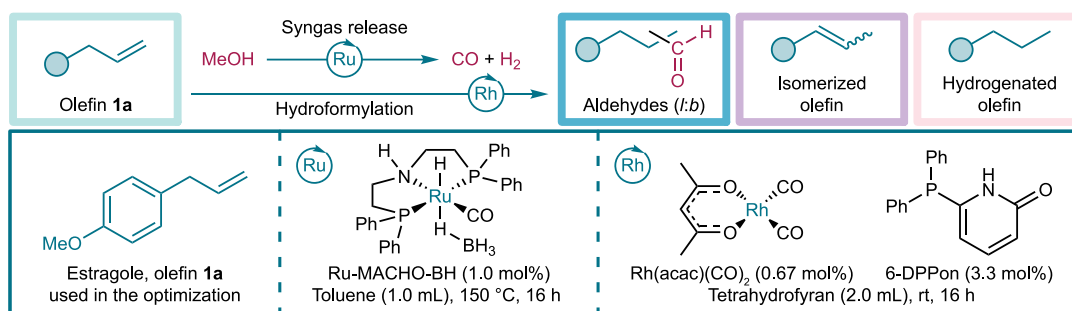
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ABSTRACT

In almost all man-made chemical products, the carbon skeletons originate from unsustainable fossil resources. As a green transition gains traction, introducing CO₂ as a feedstock for organic synthesis will be one of the keys to a carbon-neutral chemical industry. However, redesigning large scale processes for alternative feedstocks is challenging. Methanol sourced from CO₂ is presently becoming available, linked to the emergence of a methanol economy utilising it as circular fuel. This presents an ideal entry point to rethink the highly interconnected chemical production chains.

Here, we report that interlocking a ruthenium-catalysed methanol-to-syngas reforming with a low-pressure rhodium-catalysed hydroformylation in a two-reactor setup affords oxo products in high yields and selectivity. This study elucidates the kinetics and selectivity of syngas formation and their key role in matching both catalytic cycles. If combined with methanol-to-olefin processes and green methanol production, oxo-products could thus be generated using solely CO₂ as the carbon feedstock through a methanol platform.



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