



GREEN CHEMISTRY APPLICATIONS OF CO₂ REACTIVITY

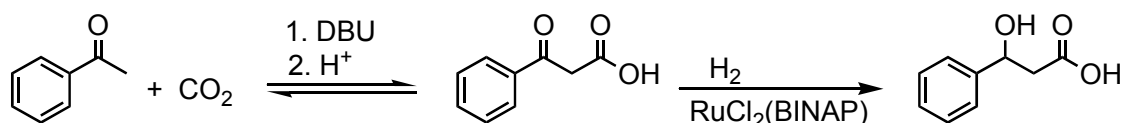
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Carbon dioxide, which is famous for hurting the environment, can be used to help the environment instead. CO₂ can be used as a green feedstock, solvent, solvent modifier, process aid, acid catalyst, and a trigger for switchable chemicals. This presentation will describe the use of reactions of CO₂ for two different kinds of green chemistry

CO₂ as a feedstock will be mentioned first. The use of CO₂ as a feedstock makes it possible to synthesize optically-pure, pharmaceutically important β -hydroxycarboxylic acids without the use of chiral auxiliaries. The synthesis involves the carboxylation of inexpensive ketones followed by the asymmetric hydrogenation of the resulting ketoacid.

Due to the inherent instability of β -keto carboxylic acids with respect to decarboxylation, research into the metal-catalyzed asymmetric hydrogenation of these substrates has been almost completely ignored. I will present the synthesis of numerous β -keto carboxylic acids from ketones and CO₂ and the asymmetric hydrogenation of several of these to give β -hydroxy carboxylic acids with good yield and very high enantioselectivity. This synthesis is advantageous due to the limited number of reactants required, their low-cost, the potential for recycling unused ketone and the elimination of the need for a chiral auxiliary.



CO₂ as a trigger will also be presented. Earlier reports from the Jessop group have described switchable-polarity solvents (solvents that can switch from high polarity to low polarity)¹⁻³ and switchable surfactants (surface-active molecules that can switch from surfactant to demulsifier).⁴ In this part of the talk, recent developments in the area of switchable reagents will be described, including switchable-hydrophilicity solvents, switchable solutes, and new applications.

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