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CO_2 as Dehydrogenation Agent for Aromatics

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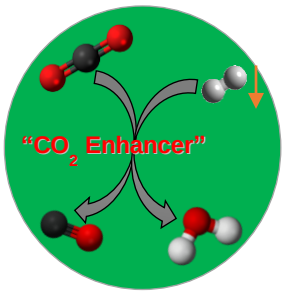
CO_2 has been demonstrated as dehydrogenating agent for the conversion of alkane and alkylaromatics to the corresponding olefins alkenyl aromatics with the increased acivity and selectivity. Also CO_2 use could alleviate the equilibrium limit as well as increase the catalyst stability by the partial contribution of the oxidative dehydrogenation. And additionally hydrogen by-produced by the dehydrogenation process at high reaction temp. could be removed with CO2 through the reverse water gas shift reaction and deposited carbon could be partially removed by the reverse Boudouard reaction. Those roles of carbon dioxide contribute to get the enhanced activity together with the enhanced selectivity as well, which could be coined as a Soft oxidant.

Here, CO_2 was applied to remove the hydrogen by-produced during the aromatics formation starting from propane or alcohols such as iso-butanol, which required dehydrogenation or dehydration steps followed dehydrocyclization steps. And the dehydrogenation of methanol and side-alkylated aromatics like ethylbenzne/styrene from toluene and methanol were investigated under the CO_2 stream. This aromatization and dehydrogenation processes produced large amount of hydrogen and suffer from heavy coke formation and fast deactivation. However, when CO_2 was used both activity and selectivity were enhanced together with catalyst stability. In here, the role of CO_2 used was proved as hydrogen scavenger in the hydrogen producing reactions such as aromatization of butanol and propane and dehydrogenation of methanol. These approaches are based on the strategy of the use CO_2 not only for oxygen demanding reactions but also for the hydrogen scavenging reactions.



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