Bromine and iodine for selective partial oxidation of propane and methane

The oxidative dehydrogenation of propane to propylene can be enhanced through the addition of a halogen to a feed of oxygen and propane. In this paper, we examine halogen-assisted oxidative dehydrogenation by a mixture of I\textsubscript{2} and Br\textsubscript{2}. We find that adding a small amount of Br\textsubscript{2} to a feed of I\textsubscript{2}, C\textsubscript{3}H\textsubscript{8}, and O\textsubscript{2} produces propylene with 71% propane conversion and 83% propylene selectivity. Good performance is also obtained if a small amount of I\textsubscript{2} is added to a feed of Br\textsubscript{2}, C\textsubscript{3}H\textsubscript{8}, and O\textsubscript{2}. In both cases, the propylene yield is greater than the sum of the yields obtained with iodine and bromine separately. A variety of studies were performed to help understand the reaction mechanism. Methane halogenation was also investigated by using combinations of iodine and bromine to produce methyl iodide, and a microkinetic model was also constructed for methane halogenation in the gas-phase to help understand the mechanism.

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