

Direct methane activation to oxygenates on
Fe-modified zeolites with N₂O oxidant

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With increasing demand of alternative clean fuels from natural or shale gases, the utilization of methane to useful chemicals or fuels has been investigated widely. An alternative way to transform methane into useful oxygenates, a direct partial oxidation of methane with N₂O oxidant to methanol and dimethyl ether (DME) was investigated in the present work. Fe-modified zeolites were used because of the superior activity of the Fe-oxo species on the Fe-zeolites. The α-oxygen species of the Fe-oxo species showed a higher capability to activate C-H bond of methane, and the acid sites on zeolites was responsible for the oxygenate formation selectively. The types and amounts of acid sites and the number of α-oxygen sites were quantified and compared to verify the different conversion of methane and selectivity to oxygenates on the Fe-modified zeolites through the characterization of Fe-oxo species and acid site measurements.

Key words: CH₄ activation; Oxygenates; N₂O oxidant; Fe-modified zeolite; Acid sites; α-oxygen sites.