Surface-oxygen-driven oxidative coupling of methane at the lower reaction temperature to produce C2 hydrocarbons using mixed oxide-supported catalysts

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With the development of abundant natural and shale gas, the direct conversion of methane, the major components of these fossil fuels, attract the significant interest in industry and academica because of its difficult processibility. The oxidative coupling of methane (OCM) couples methane molecules to form ethylene and ethane in order to further produce fuels and chemicals. Because of the high reaction temperature (700 - 900 °C) to obtaine high yields of desirable products, the OCM process has been difficult to commercialize. We developed a less energy-intensive OCM process that exhibites higher activity at a lower reaction temperature using Mg-Ti mixed oxide-supported Na/W/Mn catalysts. The catalyst consisting of Mg/(Mg+ Ti) = 0.5 (mol/mol) exhibited the highest C2 hydrocarbon yields, which were higher than those of the conventional SiO_2-supported catalyst. The improved catalytic activity of the mixed oxide-supported catalysts was attributed to more active surface lattice O atoms.