

The optimal conditions for partial oxidation of n-butane over ceria-promoted Ni/calcium hydroxyapatite

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LPG has good infrastructure and is expected to produce hydrogen, ideal fuel for PEMFC. However, studies on partial oxidation (POX) of LPG are very few. POX of n-butane, a main component of LPG for vehicles, is investigated in this research. Ceria-promoted Ni/calcium hydroxyapatite catalysts ($\text{Ce}_x\text{Ni}_{2.5}/\text{Ca}_{10}(\text{OH})_2(\text{PO}_4)_6$; $x = 0.1-0.3$), which had been recently reported in POX of methane and propane, was tested for POX of n-butane. The experiments were carried out with changing ceria content, $\text{O}_2/\text{n-C}_4\text{H}_{10}$ ratio and temperature. As the $\text{O}_2/\text{n-C}_4\text{H}_{10}$ ratio increased up to 2.75, n- C_4H_{10} conversion and H_2 yield increased and the selectivity of methane and other hydrocarbons decreased. But, with n- $\text{C}_4\text{H}_{10}/\text{O}_2 = 3.0$, n- C_4H_{10} conversion and H_2 yield decreased. This is considered that too much oxygen may inhibit the reduction of Ni or induce the oxidation of Ni, which results in poor catalytic activity. $\text{Ce}_{0.1}\text{Ni}_{2.5}/\text{Ca}_{10}(\text{OH})_2(\text{PO}_4)_6$ showed the highest n- C_4H_{10} conversion and H_2 yield on the whole.