CO and CO_2 methanation over Co/CeO_2 catalysts

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In order to tackle the high CO_2 atmospheric level, which mainly causes the numeral urgent environmental issues, active works are now undergoing on CO_2 utilization as the initial carbon source. One of them is CO_2 methanation to synthesize methane, which can be then stored and transported through a well-developed gas grid. Since CO_2 methanation is an exothermic and thermodynamically limited reaction, active catalysts at low temperature should be developed. Although cobalt is one of the active methanation catalyst candidates, its high price is the obstacle against its industrial applications. Thus, the low cobalt loading is plausible. Furthermore, CeO_2 is considered as a promising support due to its redox properties. Additionally, the surface oxygen vacancy of CeO_2 support can contribute to the catalytic performance. In this study, two typical methods as co-precipitation and wet-impregnation methods were used. The pretreatment conditions, particularly calcination temperature, were compared. The co-precipitated $Co-CeO_2$ catalyst calcinced at 300 ℃ is found to show the best performance among the prepared catalysts due to the large surface area and small CeO_2 crystallite size.