

CO₂ Hydrogenation Using Mesoporous Metal Oxide Spinel Having Basicity

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Conversion of CO₂ to other chemicals (e.g., CO, methanol, hydrocarbon) in the presence of molecular hydrogen gas has been attracting great attention to many scientists. In this work, such hydrogenative CO₂ conversion has been investigated using mesoporous spinel-type metal oxides as heterogeneous catalysts. Aluminum based spinel materials having different divalent metal components (i.e., ZnAl₂O₄, CuAl₂O₄, CoAl₂O₄, MgAl₂O₄) have been synthesized and characterized with various tools. One remarkable feature of these materials is that they have different basicity (amount and strength) depending on the type of divalent metal cations. Accordingly, the binding affinity of catalytic surfaces to the acidic CO₂ molecule is totally different and hence they show very different catalytic performances. The results demonstrate that the conversion of CO₂ is proportional to the surface basicity of metal oxide spinel. These materials show high selectivity to CO except for CoAl₂O₄. Especially, CuAl₂O₄ having the strongest basic property shows high conversion of CO₂ and selectivity of CO.