An Investigation of CO_2 sorption on Metal loaded Zirconia (M=Ni, Ca, Zn, Mg and rare earth metals)

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For the operation of the three-temperature stage CO_2 capture processes, a mid-temperature CO_2 absorbent is necessary component. MgO is a strong candidate for the mid-temperature absorbent for its high CO_2 capacity at the mid-temperature range. However, MgO requires a promoter such as alkali metal nitrate salts, which gives rise to many problems for practical capture processes. Therefore, it is of interest to develop promoter-free mid-temperature CO_2 absorbents.

In the present study, we examined the reactivity of oxygen atoms bound to various metal ions (M=Mg, Ca, Ni, Zn, and rare earth metals). Metal-loaded zirconia is prepared by impregnation method, which is followed by calcination. Porous $ZrO(OH)_2$ and $M(NO_3)_x \cdot yH_2O$ (M=Mg, Ca, Ni, Zn, and rare earth metals) are used in the experiment. We characterized the samples through XRD and EDS, and measured the CO_2 absorption capacity of the samples by TGA. The CO_2 absorption capacity showed differences depending on the metal and the amount of metal.