Hierarchically porous $MgO-CeO_2$ sorbent beads: Towards highly efficient CO_2 capture at intermediate temperatures

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Among the various technologies for CO_2 capture, solid sorbents are attractive as they are operative over a wide range of temperatures and pressures, and are generally environmentally friendly. For ultimate industrial application, the developed sorbents should be structured into pellets or beads, retaining high and stable working capacity. Herein, we report a novel combustion-assisted method for the development of $MgO-CeO_2$ beads. The as-synthesized $MgO-CeO_2$ beads feature a spherical shape with diameters of hundreds of micrometers, hierarchical porosity, and homogeneously mixed metal composites. The mechanism of formation of the spherical $MgO-CeO_2$ was proposed via a combined used of the thermogravimetric analysis, FT-IR and NMR spectroscopy, and morphological characterization. Furthermore, the sorption capacity of the salt-promoted $MgO-CeO_2$ beads showed high sorption capacity, with remarkable cyclic stability, where the working capacity at the 30th cycle is 120% of that at the first cycle. The CO_2 capture performance of as prepared sorbents beads was compared with that of the corresponding powder and pressed-pellet.