

Methane Reduction, Water Decomposition and Air Oxidation of Copper-Containing $\text{Fe}_2\text{O}_3/\text{ZrO}_2$ Media

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The three-reactor chemical-looping process (TRCL) for the production of hydrogen from natural gas is attractive for both CO_2 capture and hydrogen production.

Copper containing $\text{Fe}_2\text{O}_3/\text{ZrO}_2$ media were prepared by co-precipitation method. The atomic ratios of Cu/Fe for the synthesized $\text{CuO}-\text{Fe}_2\text{O}_3/\text{ZrO}_2$ were 1/2, 1/4, 1/6 and 1/8.9. The redox properties of the media were isothermally tested by thermal gravimetric analyzer(TGA) at 825, 850, 875 and 900 °C for methane reduction, water decomposition and air oxidation.

Copper containing $\text{Fe}_2\text{O}_3/\text{ZrO}_2$ media showed the improvement in the reactivity than $\text{Fe}_2\text{O}_3/\text{ZrO}_2$ during repeated redox cycles. $\text{CuO}-\text{Fe}_2\text{O}_3/\text{ZrO}_2$ media with the atomic ratios of 1/4 and 1/6 have showed the remarkable improvements in reactions with methane and water.