Reduction and water splitting of metal oxides for chemical-looping hydrogen generation by thermogravimetric analysis

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As a hydrogen generation method, water splitting is an environmental friendly process which does not produce harmful pollutants. Several reduction gases should be considered for heat supply since the direct reduction of metal oxide is highly endothermic reaction. In the present study, nickel, iron, manganese and copper oxides supported on bentonite have been evaluated for "chemical-looping hydrogen generation (CLH)" by oxidizing with water splitting and reducing with synthesis gas in thermal gravimetric analyzer (TGA). Properties of particles prepared were analyzed by SEM, XRD and Ar-BET. The reduction gas was the mixture of H_2 and CO and steam was injected with nitrogen as a carrier gas. The reactivity of reduction increases with increasing temperature except CuO/bentonite at high temperatures above 1023 K, and there is carbon deposition on the particles by CO. Each metal oxide has respective advantages and disadvantages, so that determination of metal oxides should be varied according to process conditions.