Abstract:

Presented paper covers results of research work on novel fuel combustion technology, so called chemical looping combustion (CLC). The CLC is believed to be promising, since the concentrated CO₂ stream is produced followed water condensation without any energy penalty for CO₂ separation. Oxygen carrier for CLC process is crucial for development of this technology. Since the synthetic oxygen carriers are expensive, the researchers seeking the cheaper alternatives. One of the solution is to use the raw materials such as ores or concentrates from metallurgical industry.

The objective of this work was to study the properties and kinetics of reduction and oxidation reactions for selected naturally occurring oxygen carriers. Fe-based concentrate was selected for that analysis. Test have been performed at isothermal conditions within 800 to 950 °C temperature range in multiply redox cycles using TG. Reduction and oxidation reactions were carried out by using CH₄ in Ar and synthetic air, respectively. The samples showed promising results such as a sufficient reactivity with the fuel and also a repeatable performance. Kinetic parameters such as the activation energy, the pre-exponential factor and the reaction model were determined for redox reactions. Models of the reactions were selected by using model fitting method.

Keywords: natural oxygen carrier, chemical looping combustion, thermogravimetric analysis, kinetics

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