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Assessment of kinetic model for ceria oxidation for chemical-looping CO_2 dissociation

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Abstract

Chemical looping technologies are identified as to have an excellent potential for CO_2 capture and fuels synthesis. Oxygen carriers are the fundamental component of a chemical looping process, and the choice of stable and efficient carriers with fast redox kinetics is the key to the successful design of the process. Hence, understanding the reaction kinetics is of paramount importance for the selection of an appropriate oxygen carrier material. This work provides a method for kinetic model selection based on a statistical approach to identify the reaction mechanism. The study experimentally investigates the oxidation kinetics of $CeO_{2-\delta}$ by CO_2 and applies a statistical method for the selection of the best-fitting kinetic model for the reaction. The kinetic study is performed in the temperature range of 700-1000^{o}C with aCO_2 concentration between 20-40 vol.% in the feed. The measured peak rates of CO production on ceria were influenced both by temperature and concentration of reactant. The total CO production was more influenced by the temperature than by CO_2 concentration, with a maximum CO yield of 33.66