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CHEMICAL-LOOPING COMBUSTION FOR CLEAN ENERGY PRODUCTION FROM METHANE AND AN OXYGEN CARRIER REACTION

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Increasing amounts of CO2 released to the atmosphere can promote the natural greenhouse effect, and so affect the global climate. The use of chemical-looping combustion could be an option for reducing emissions of this greenhouse effect gas in atmosphere by using fossil fuels, as energy source, by separating and disposing CO2 from flue gas. In this process, metal oxide is used to transfer oxygen to fuel for its combustion and thus, the flue gas issued from the combustion is composed exclusively of CO2 and H2O, which could be separated without any energy lost, by condensation of water. The metal obtained from the combustion is regenerated in a second reactor using air, and recycled. In chemical-looping combustion, it is important that the metal oxide, which is used as an oxygen carrier, has a sufficient reduction and oxidation rate and should be enough strength to limit particle breakage; it is also an advantage if the metal oxide is cheap and environmentally sound. In this study, a number of different metals and their corresponding oxides were tested and their feasibility was investigated. The kinetics study of oxidation and reduction of respectively the metals, using atmospheric air and metals oxide, using methane was realised in a fixed bed reactor. The performance of each reagent was evaluated and their reactivity was compared. The parameters obtained are closely related and could be used to design a chemical-looping combustion system based on two interconnected reactors.