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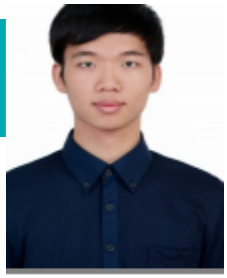

Redox Behavior and Sulfur Dioxide Reduction for Iron-Manganese Oxygen Carriers during Chemical Looping Combustion

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Abstract: In this study, iron-manganese oxygen carriers with various mass ratios were prepared for the investigation of chemical looping combustion and desulfurization process under different operation conditions in TGA. Effect of reaction temperature, oxygen partial pressure and operating atmospheres on the reactivity of iron-manganese oxygen carriers were discussed. Experimental results showed that manganese oxygen carriers improved the reduction kinetics of iron oxygen carriers and reduced the operation temperature of chemical looping combustion without greatly reducing the combustion efficiency. The redox kinetics were established based on the conversion of oxygen carriers, mechanism assumptions and the transformation of crystal structure. The regression analysis shown that the reduction of iron-manganese oxygen carriers follows a reaction order model, which is a pore diffusion reaction mechanism and the reaction rate proportional to the concentration of reactants. The oxidation of iron-manganese oxygen carriers follows a nucleation and nuclei growth model.

The performance of desulfurization capability of iron-manganese oxygen carriers at various reaction temperatures, and the regeneration of oxygen carriers by using heat were studied. Manganese oxygen carriers were found to have the highest desulfurization capability among all the tested oxygen carriers. However, the thermal instability causes manganese oxygen carriers decompose at high operation temperature, which greatly reduce the desulfurization capability.

Biography: Yu Shu has completed his Bachelor at the age of 22 years from Chung Yuan Christian University (CYCU). Currently studying for a master's degree at National Taiwan University of Science and Technology (NTUST). My adviser is Professor Young Ku. His research fields are chemical looping process and advanced oxidation process.

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