

Jet attrition characteristics of chemical looping oxygen carriers and CO<sub>2</sub> sorbents

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Sorption-enhanced chemical looping reforming is a process to produce synthesis gas, mostly a mixture of CO and H<sub>2</sub>, from hydrocarbon fuels, without having to separate O<sub>2</sub> from air. In this system, particle attrition is an important consideration due to the high gas velocity and chemical reactions, affecting reactor performance, operating conditions and material loss by entrainment and elutriation.

Fundamental studies on jet attrition with iron as oxygen carrier and limestone as CO<sub>2</sub> sorbent were carried out with varying temperature, jet velocity, duration, solid species weight fraction and the presence of chemical reactions to understand how these various factors affect attrition. Experimental investigation included comparing SEM images and particle size distribution data before and after attrition, and particle size changes with different operating conditions. Furthermore, crushing strength and breakage energy tests were determined with a compression unit to understand how material properties affect particle attrition. In addition, porosity, specific surface area and pore size distributions were measured to investigate the effects of chemical reaction on attrition.