Chemical-looping combustion in an annular circulating fluidized bed reactor

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The chemical-looping combustion (CLC) process has an advantage of no energy loss for CO_2 separation without NO_x formation. This process consists of oxidation and reduction reactors where metal oxide particles are circulating through these two reactors. A circulating fluidized bed (CFB) reactor is considered because it has excellent gas-solid mixing characteristics. In this study, CLC characteristics of NiO-Fe_2O_3/bentonite particles were determined in a CFB reactor with double loops of inner and annular regions. Methane and air were used for reduction and oxidation gases, and combustion efficiency was analyzed the flue gas from the reduction reactor by gas chromatography. The reactivity increases with increasing NiO content and temperature. For complete combustion of methane, the optimum gas velocity of methane is around $2u_{mf}$ in the present reactor. At the incomplete combustion condition, CO is produced in the range of several percentages, but H_2 from the reduction reactor and NO_x from the oxidation reactor were not detected.