CHEMISTRY OF GASIFICATION AND ASH AGGLOMERATION IN THE U-GAS[R] PROCESS.

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A single-stage, fluidized-bed, ash-agglomerating process for generation of industrial fuel gas or synthesis gas from coal has been tested in a pilot plant with coke, char, and coal as feed. Pilot plant and laboratory data on gasification reactivities have been obtained and incorporated into a mathematical model. The chemistry of agglomeration of ash was investigated by methods including optical and electron microscopy, chemical analyses, and fusibility tests. Agglomeration of ash into rounded beads occurred with relative ease in runs on coke; the agglutinating agent is an iron-rich, relatively low-melting silicate in which other ash is embedded. Agglomeration of ash from coal was more difficult, because most of the iron was present in the form of sulfide and thus unavailable for reaction with aluminosilicates (clay minerals). The gas composition in the reactor bed is thermodynamically favorable for oxidation of the ferrous sulfide at regions near the oxygen inlet only. Oxidation of the ferrous sulfide and agglomeration of ash from coal were achieved by changing the mode of oxygen feed to the reactor.