Solid Carbon Combustion

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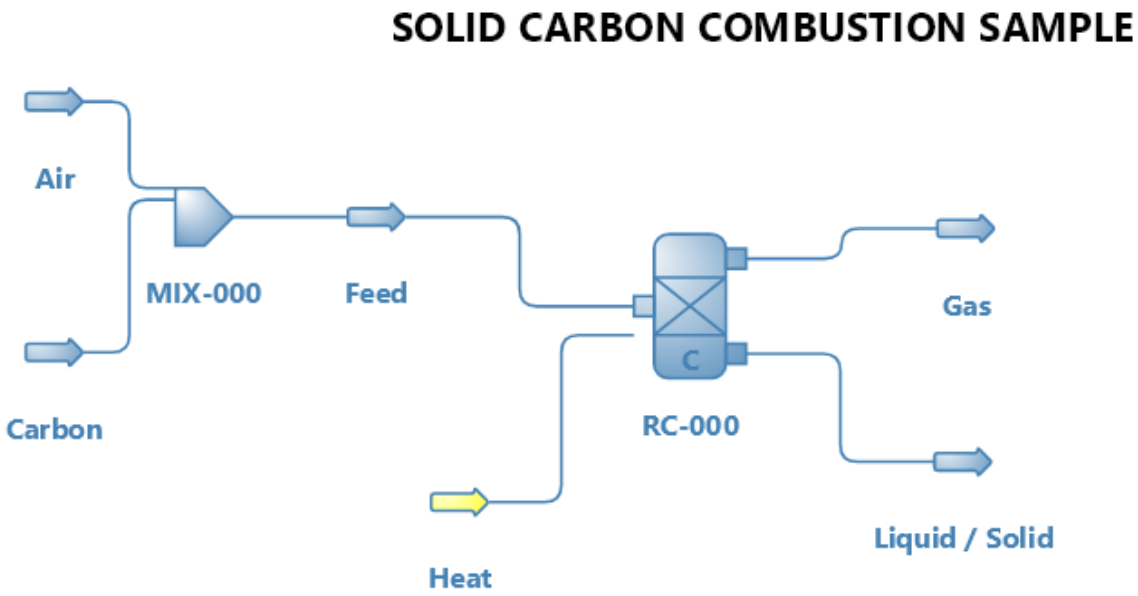
Background & Description:
Combustion, or burning, is a high-temperature exothermic redox chemical reaction between a fuel (the reductant) and an oxidant, usually atmospheric oxygen, that produces oxidized, often gaseous products, in a mixture termed as smoke. Combustion in a fire produces a flame, and the heat produced can make combustion self-sustaining. Combustion is often a complicated sequence of elementary radical reactions. Solid fuels, such as wood and coal, first undergo endothermic pyrolysis to produce gaseous fuels whose combustion then supplies the heat required to produce more of them. Combustion is often hot enough that incandescent light in the form of either glowing or a flame is produced. In this process, solid carbon mixed with air at 298.15 K and 101325 Pa is sent to a conversion reactor. Reaction takes place between carbon and oxygen to form carbon dioxide where 100% conversion is considered for carbon.



Results:

Object	Liquid / Solid	Gas	Feed	Carbon	Air	
Temperature	298.15	298.15	298.15	298.15	298.15	K
Pressure	101325	101325	101325	101325	101325	Pa
Mass Flow	0.005332	0.300224	0.305556	0.027778	0.277778	kg/s
Molar Flow	0.399297	9.597106	11.998313	2.312906	9.685407	mol/s
Mixture Specific Enthalpy	-1671324.74	-0.315341	-216808.95	-2384880.36	-0.239059	kJ/kg
Mixture Specific Entropy	-4736.77	0.132923	-614.346351	-6,59.41	0.172224	kJ/[kg.K]
Molar Fraction (Mixture) / Carbon dioxide	0.000635	0.208565	0	0	0	
Mole Fraction (Solid Phase) / Carbon dioxide	0	0	0	0	0	
Molar Fraction (Mixture) / Nitrogen	0.000009	0.784699	0.627661	0	0.777548	
Mole Fraction (Solid Phase) / Nitrogen	0	0	0	0	0	
Molar Fraction (Mixture) / Oxygen	0	0	0.166847	0	0.20669	
Mole Fraction (Solid Phase) / Oxygen	0	0	0	0	0	
Molar Fraction (Mixture) / Water	0.220416	0.006736	0.012724	0	0.015762	
Mole Fraction (Solid Phase) / Water	0	0	0	0	0	
Molar Fraction (Mixture) / Carbon	0.77894	0	0.192769	1	0	
Mole Fraction (Solid Phase) / Carbon	1	1	1	1	0	

Table 1: Streamwise Results for Solid Carbon Combustion