JQ.3.2.Setup

September 22, 2014

(3.2) Propane and air are supplied to a combustion chamber so that 20 g/s of propane reacts. the reaction forms $H_2O, CO_2, $ and CO where the molar ratio of CO to CO_2 is 0.1. The exhaust gases flow at a rate of 360 g/s. Assuming the process is steady and conditions are uniform at the exit, compute the exit mass fraction of the CO.

Setup:

First sketch a three port reactor with fuel and air inlets and a product outlet. Recognize that the three port system also represents a chemical reaction:

Balance the stoichiometric case using the constraint relationship between CO_2 and CO.

$$C_m H_n N + a(O_2 + 3.76 N_2) \rightarrow bCO_2 + dH_2O + fN2 + eCO$$

For the stoichiometric case, find out how much air will be required to consume 20 g/s of propane.

Will this cause 360 g/s of product to flow out? Decide how much air is needed. Calculate the mass fraction of CO on the right hand side of the chemical balance equation.

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