Questions for Class 14
Char Oxidation 2
Chemical Engineering 733

Reading: Pages 378-408 in the Lee Smith book

1. Several correlations have been developed for the surface product ratio (CO/CO_2). The models have the form of:

$$\frac{moles\ CO}{moles\ CO_2} = A\,e^{-\frac{E}{RT}}$$

Please compare the % of carbon forming CO (i.e., (moles CO)/(moles CO + moles CO_2)) computed from the following correlations and comment:

Reference	A	E (kcal/mol)
Hurt-Mitchell #1	3.0×10^8	60
Hurt-Mitchell #3	4.0×10^4	30
Hurt-Mitchell #4	2.5×10^8	60
Hurt-Mitchell #5	5.0×10^8	60
Tognotti	1.02×10^2	5.921

2. What are the key features of intrinsic char oxidation models? (You may want to refer to Table 78).

3. Please discuss the effectiveness factor and how it is used.

4. What is the difference between the Thiele modulus approach to modeling intrinsic reactivities and the three approaches outlined in Table 78?

5. What are some of the complications that limit the use of intrinsic models in comprehensive engineering calculations?

6. Walter Reade and Dr. Hecker have developed a different kind of intrinsic model, using the following steps:
    (1) generate a high temperature char experimentally,
    (2) perform TGA experiments to obtain TGA rates as a function of burnout for that starting char, and
    (3) use the TGA rates with an intrinsic model to calculate the high temperature rates as a function of burnout.
    Please comment on potential advantages and disadvantages of this approach.

7. Please explain the empirical model of Charpenay (pp. 400-401) and comment on its usefulness.