Questions for Class 15 (June 6)

Char Oxidation 3

Chemical Engineering 733

Reading:

- pages 356-365 in textbook,
- Hong, et al., "Modeling High Pressure Char Oxidation Using Langmuir Kinetics with an Effectiveness Factor," Proceedings of the Combustion Institute, 28, 2215-2223 (2000). (pdf).
- Hurt et al., Combustion & Flame, 113, 181-197 (1998) (pdf)

1. One of the current industrial reasons for studying char combustion is to identify the causes of decreases in reactivity at late stages of burnout. In other words, a coal combustor may have excessive carbon in the fly ash, and therefore has to pay disposal costs. Please discuss possible causes for this decrease in reactivity in late stages of burnout given by Hurt, and how his model works.

2. Discuss the experimental and data reduction method to determine both the apparent reaction rate (at high temperature) and the CO/CO_2 product ratio?

3. The high pressure data shown in the book (Figs. 123-124, Table 77) were explained by changing the activation energy at each pressure. Usually, activation energies are thought to be independent of pressure. Please explain what could be wrong with the experiments or the data reduction method.

4. Please explain the approach of Hong, and explain his results.

5. Ca is thought to be a catalyst in char combustion. Why does it only cause significant effects at relatively low temperatures and for low rank coals?