Questions for Class 4 (May 6)
Chemical Engineering 733

Reading Assignment: Pages 37-75 in Lee Smith book (green), Pages 21-27 in Jenkins paper (See "Biomass Articles" on class web page)

1. Describe the major geologic factors that affected coal formation and discuss why this information is important. Based on these factors, explain why there is no coal in California or Nevada.

2. Describe the difference between coal lithotypes and coal macerals, and compare the major classifications of each.

3. A common way to describe coals is based on elemental composition, such as in Figure 2.3 (Ch. 2, Fig. 3) in the text. Note that the numerical values on the axes in this figure were misprinted. Please sketch a similar chart, showing (a) the coals in Fig. 2.3 in a band (not each point), (b) the region where oil (petroleum) would be on this chart, (c) the region where peat would be, and (d) the region where biomass/wood would be. Cite your sources.

4. Demonstrate how to convert proximate and ultimate coal analyses data to a dry, ash-free basis using the following coal data:

Moisture	6.17
Volatile Matter (moisture free)	37.87
Ash (mf)	9.90
H (mf)	4.69
C (mf)	71.12
N (mf)	1.39
S (mf)	3.80
O (mf)	9.11
Heating Value (Btu/lb, dry, ash-free)	14,102

   What rank of coal is this, and which coals in Figure 2.3 are similar coals?

5. Define the following:
   a. carbon aromaticity
   b. hydrogen aromaticity
   c. aliphatic carbon
   d. aromatic clusters
   e. bridges between clusters

6. For Solomon's proposed coal molecule, please find the following:
   a. elemental composition (wt% C, H, O, N, S)
   b. carbon aromaticity
   c. average number of aromatic carbons per cluster

7. Biomass is composed of cellulose, hemicellulose, and lignin. Please describe these three molecules, and contrast them with coal molecules. (Hint: search for these structures on the internet)

Additional Resources:

A very interesting site about Wyoming coal:
http://www.wsgs.wyo.gov/energy/coal