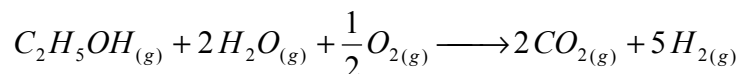


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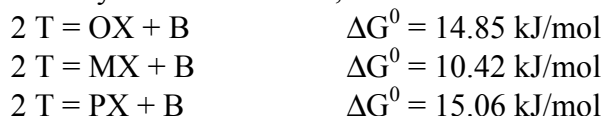
**CME 550: Chemical Reactor Design**  
**Homework 2**

Due at *beginning* of class on Friday, September 9, 2005  
Partial credit will be given in ½-point increments.

- 1) [1 pt] Levenspiel (OL) Chapter 2 problem 2.17 (the start of the question is at the bottom of p. 35)
- 2) [2 pt] The equation for reforming of ethanol to produce hydrogen can be expressed as:



- a. Calculate the equilibrium coefficient for this reaction at 298 K (you will need a table of Gibbs energies of formation, such as Table C.4 from Smith, Van Ness & Abbott).
  - b. If a stoichiometric feed of ethanol vapor, water vapor and oxygen is to be used to produce hydrogen, what is the maximum fraction of ethanol that will react at 298 K?
- 3) [3 pt] Toluene (T) can react through bimolecular reactions to produce one of three forms of xylene (ortho-xylene, OX; meta-xylene, MX; or para-xylene, PX) and benzene. The values of  $\Delta G^0$  (below) were determined at 700 K. What is the equilibrium composition (including all xylene isomers) at 700 K and 1.0 atm pressure? Suggest one way to design a process to produce mainly PX from toluene, and little OX and MX?



- 4) [2 pt] OL 2.18
- 5) [2 pt] OL 2.20