A First Course on Kinetics and Reaction Engineering
Problem 2.1

Problem Purpose

This problem will help you determine whether you have mastered the learning objectives for this unit.

Problem Statement

The water-gas shift reaction, equation (1), is used in a process for the removal of CO from hydrogen. Hydrogen is commonly manufactured by reacting steam with a hydrocarbon such as methane, and as a result, the product gas typically contains both CO and CO_2. CO_2 can be removed with relative ease by scrubbing the gas with an amine solution. Thus, before scrubbing, the water-gas shift reaction is used to convert as much of the CO as possible into CO_2. Generate an expression for the standard heat of the water-gas shift reaction as a function of the temperature.

$$H_2O + CO \rightleftarrows CO_2 + H_2 \qquad\qquad (1)$$

(You can find the necessary thermodynamic data in "The Properties of Gases and Liquids," 3rd ed. by Reid, Prausnitz and Sherwood. McGraw-Hill, New York, 1977, among other sources.)