A First Course on Kinetics and Reaction Engineering

Practice Problem 2.3

Problem Purpose

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

Problem Statement

The oxidation of ethanol to produce acetic acid is given in equation (1). Standard heats of formation (gas phase) at 298K and average gas phase heat capacities for temperatures between 298 and 400 K for ethanol, acetic acid, oxygen and water vapor are given in Table 1. Use those data to generate an expression for the standard heat of reaction (1) as a function of temperature and calculate the standard heat of reaction at 300, 350 and 400 K. Comment upon the result.

$$C_2H_6O + O_2 \rightarrow C_2H_4O_2 + H_2O \qquad (1)$$

Table 1.

Species	***ΔH_f(298 K) (kJ/mol)***	***$\hat{C}_p$ J/(mol K)***
C_2H_6O	-234	73.4
$C_2H_4O_2$	-433	71.7
H_2O	-242	33.9
O_2	0	29.7