

KE-107.3100 Process Simulation
Examination 30.10.2008; time: 13:00-16:00

-write your name & student no:

Theory (max.1h) : Answer in Finnish, Swedish or English

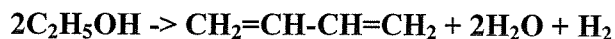
1. Explain shortly:
 - a) Activity coefficient
 - b) Dew point
 - c) Kinetic reactor
2. How physical properties are calculated in simulation
3. Optimization in process simulation

Simulation part (2h): (Save each task in *prz and *out files and write your answers on paper)

1. Simulate a 10 ideal stage packed tower with 25.4-mm Norton Super Intalox #1 ceramic saddles in atmospheric pressure for absorbing HCl from a gas stream using 20 °C water. The inlet gas flow rate is 56 kg/h H₂, 5 kg/h HCl and 4 kg/h H₂O at 30 °C and 101 kPa. The outlet gas must contain 1 mass ppm of HCl.

- a) How much water is needed?
- b) What is the diameter and packed height of the column?

2. Catalytic synthesis of ethyl alcohol produces 1-3 butadiene as the below reaction equation:



The stoichiometric feed is at 370 °C and 20 bar in the gas phase. Simulate the equilibrium yield.

3. If the ethanol conversion in task-2 reaction is 0.75, simulate the following if two liquid phases is produced:

- a) 90% of the hydrogen is separated by flash at 1400 kPa. What is the flash drum temperature?
- b) What is the composition of the streams?

Points: theory: 2p/each
simulation: 1). 4p, 2). 2p, 3). 4p and exercise attendance 4p.