

## Kem-107.3100 Process simulation

Examination: 27.10.2006 Time: 9-12

### Theory:(1 hour)

1. Explain shortly:
  - a) approach temperature
  - b) dew point
  - c) mechanistic model
2. Describe approaches for process optimization
3. What are polar compounds ? What kind of VLE models are used for them?

### Simulation part: (2 hours)

4. It is proposed by a researcher that 1-3 butadiene can be produced by synthesis from ethyl alcohol at 370 °C and 20 bar by the following reaction in gas phase:



Find out how feasible this is.

5. In the above process hydrogen needs to be separated from the reaction mixture.
  - a) If the ethanol conversion would be 0.75 and 90% of the hydrogen needs to be separated by flash at 1400 kPa, what is the flash drum temperature?
  - b) How many liquid phases is produced? What is the liquid composition(s)?
6. Design a column for the separation of 10 t/h liquid feed (in boiling point at atmospheric pressure) containing 50 w-% benzene and 50 w-% toluene. Benzene concentration in the distillate is 96 w-% and toluene in the bottom is 98 w-%. The column is in atmospheric pressure and has 15 theoretical plates with 80% efficiency.
  - a) What is the optimum feed plate by minimizing the reflux ratio
  - b) Calculate the diameter and height of the column with valve trays

Maximum points:	Theory	1-3	2p/each
	Simulation	4	3p
		5	3p
		6	4p
	Exercise		4p (100% attendance)
	TOTAL		20p