CHME 401 CHEMICAL ENGINEERING LABORATORY II EXPERIMENT 401-6 CONTINUOUS LIQUID-LIQUID EXTRACTION

OBJECTIVE

The objective of the experiment is to investigate the effect of feed flow rates on continuous extraction of water-acetic acid-ethyl acetate system. Theoretical number of trays for the separation will also be determined.

PRELIMINARY WORK

- 1. Study phase equilibrium of ternary systems and continuous extraction equipment (extraction towers; packed or tray towers)
- 2. Visit the lab. in advance to experiment and familiarize yourself with the experimental set-up with the consent of the teaching assistant.

DESCRIPTION OF THE EXPERIMENTAL SET-UP

Continuous liquid-liquid extraction unit consists of an extraction column of 60-cm height, top and bottom separators (borosilicate flasks mounted top and bottom of the column), two feed and two collection tanks with volume of 25 L each. Flow meters to adjust the flow rate of heavy and light phases and a stirrer with 7 disks. It allows operating extraction continuously and collecting samples from heavy or light phase according to user's choice. Experimental setup is given in Figure 1.



Figure 1. Continuous Liquid-Liquid Extraction Set-up

EXPERIMENTATION

Acetic acid concentrations from heavy and light phases will be analyzed by titration and steady state values will be taken.

Procedure

- 1) Fill tank D1 with 20 L of heavy phase (water- acetic solution 10 % acetic acid)
- 2) Fill tank D2 with 20 L of Light phase (Ethyl Acetate)
- Start Pump G1 switching the button on control panel to 1 and adjust flow rate to 20 L/h
- 4) Start Pump G2 when liquid level reaches to top of the separator and adjust flow rate to 20 L/I
- 5) Switch stirrer M1 on and set stirrer speed to 700 rpm
- Wait 15 min. take sample from bottom by opening V10 and collecting 100 ml of heavy stream entering to D4.
- 7) Titrate samples with 1M NaOH using phenolphthalein as indicator.

 Readjust flow rate of heavy stream to 10 and 30 L/h and repeat steps 6 and 7

Analysis

- 1) Calculate acetic acid concentrations in extract and in raffinate phase and comment on effect of flow rate on extraction
- 2) Calculate theoretical tray number for one of the runs conducted.