CHAPTER VIII

CONCLUSION

Mass transfer operation by controlled cycling operation is superior to conventional operation for three main reasons:

The first is an increased mass transfer area between the two phases. The dispersed phase in the controlled cyclic operation appears to be subjected to a greater degree of fragmentation and coalescence, and thus a larger interfacial area and concentration gradient apparently exist between the two phases. Thus the amount of mass transfer of the solute from MIBK phase to H_2O or extract phase theoretically increases, corresponding to the equation of mass transfer below

$$N_A = KA'\Delta C$$

where N_A = The amount of solute transfer from one phase to other phase

K = Overall mass transfer coefficient

ΔC = Concentration driving force

A' = Mass transfer area which solute passes from one phase to other phase.

The second is that when the pump injects the fluid into the column, the kinetic energy of this operation is transfered into the droplets in the form of internal energy for both phases; the dispersed phase and continuous phase. This internal energy leads to an increase in the movement of the solute in both phases, resulting in an increase in the overall mass transfer coefficient and the efficiency of extraction. This phenomenon has been studied by Vermizs and Kramer (1954), Reman and Olney (1955). But there is a limit to the size of the droplet. If the size of the droplet is too small, the movement of the solute in the droplet is reduced with the result that there is a decrease in the overall mass transfer coefficient and the efficiency of extraction. Hence it takes a longer time for the two phases to separate, and this decreases the capacity of the column.

The third is the increase in the driving force or concentration difference throughout the column. So the rate of mass transfer is increased as shown by mass transfer equation, which was perviously mentioned. The result of this phenomenon is the apparent increase in efficiency of extraction.

The main problems of controlled cycling operation are the complexity of the equipment and the difficulty in controlling the system for each run.

Some important facts on controlled cycling extraction on the basis of the experiments can be summerized as follows:

1. The use of sieve plates and controlled cycling operation results in a superior capacity and high efficiency column.

2. Volumetric flow ratio (H_2O/MIBK), and fraction open are important variables in controlled cycling extraction.

3. Column efficiency of controlled cycling is almost independent of volumetric flow rate. This is significant because it

leads to a higher capacity; that is, it makes the capacity of the controlled cycling extraction column considerably greater than that of other types of extraction columns operating at the same efficiency.

4. If the total cycle time is decreased, the efficiency of the column will decrease and the capacity of the column will increase.

5. Differrent controlled cyclic periods affect the efficiency of the column differently. However, it is difficult to find out which controlled cyclic period in the best.

6. The results of this experiment are similar to those obtained by Szabo, Lloy, Cannon and Speaker. As the volumetric flow rate increases, the efficiency of extraction increases slightly. The efficiency of extraction increase as volumetric flow ratio increases.