SOLID-LIQUID EXTRACTION (LEACHING)

SUMMARY OF THEORY

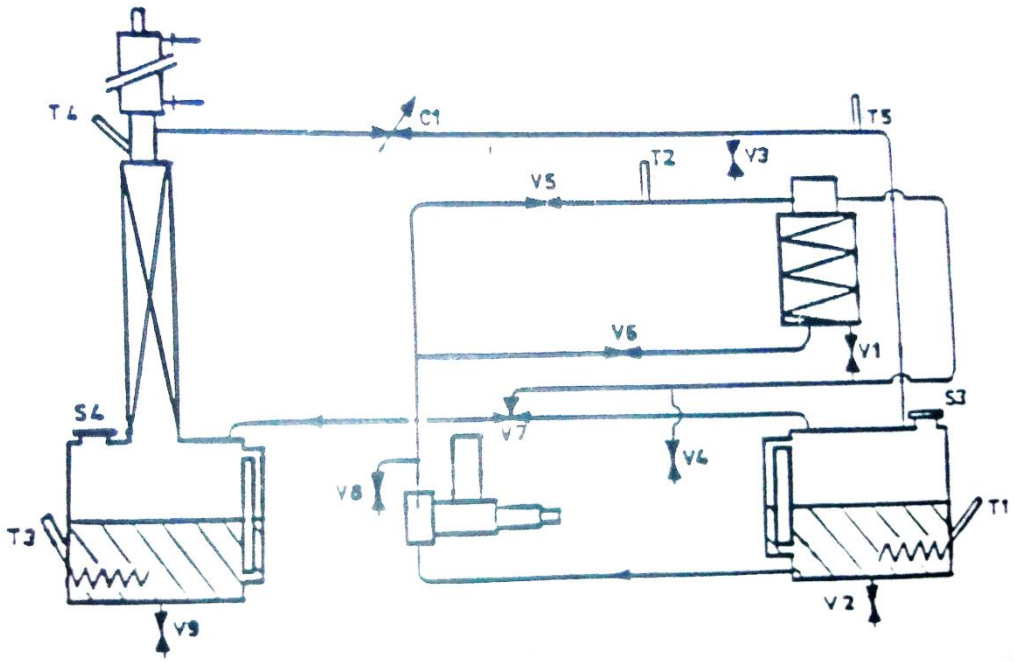
Many biological and inorganic and organic substances occur in a mixture of different components in a solid. In order to separate the desire solute constituent or remove an undesirable solute component from the solid phase, the solid is contacted with a liquid phase. The two phases are in intimate contact and the solute or solutes can diffuse from the solids to the liquid phase, which causes a separation of the components originally in the solid. This process is called solid liquid extraction or simply leaching.

The concentration of the extract leaving the extractor will decrease with time as the substance is extracted. Thus, the design of an extraction (leaching) process is influenced by the point at which further extraction is not economic.

OBJECT OF CEXPERIMENT

To extract soluble solids from food materials using solid liquid extraction unit.

EQUIPMENT SET-UP



PROCEDURE

Fill the sample bag with say, 100 g of dried and ground food sample, tie up the open end and place in extractor vessel. Replace the funnel and lid.

Fill the right-hand vessel with 2 liters of water and set the pump to 60 %. Switch on the vessel heater and bring the water temperature to say 50 C. Switch on the pump (S2) and take samples from points V8 and V4 at intervals of a few minutes discarding the first few ml each time. Record the temperature T2.

Samples may be conveniently analyzed with a refractometer if available.

CALCULATIONS

i. Plot the soluble solid concentrations at the two sampling points as a function of time to show the general characteristics of the extraction process.

ii. Make the material balance around on both extractor vessel and solvent vessel. Solve the final expression in terms of soluble solid concentration and time.

iii. Fit the data obtained in part (i) to analytical expression obtained in part (ii) to determine the constants.

iv. Replot the concentrations vs. time on the same paper used in part (i) to compare the analytically fitted data with the experimental one.

v. Calculate the total yield.

DISCUSSION

i. Discuss the goodness of fit of your data obtained in calculations part (i)

ii. Discuss the effect of temperature, flow rate and direction of flow on the extraction time.

iii. What is the effect of initial concentration on the extraction time?

iv. What are the steady state concentrations of soluble solid in both vessels?

Literature to be read before the experiment:

1. *Christie J. Geankoplis. "Transport processes and separation process principles" Prentice Hall Professional Technical Reference, 2003.*