DISTILLATION : PURIFICATION OF A MIXTURE OF MISCIBLE LIQUIDS

EXPERIMENTAL TECHNIQUES REQUIRED

Fractional distillation (T 10), greasing glass joints (T 11), gas chromatography (T 13)

OTHER DOCUMENTS

Experimental procedure, report template, gas chromatography traces

INTRODUCTION

Distillation is used separate miscible liquids based on differences in boiling points. It is used to purify mixtures of liquids (*e.g.* crude oil purification), to remove liquids from mixtures or materials (*e.g*. distillation of alcoholic beverages) or to help drive equilibrium reactions to completion (via Le Chatelier's principle) by the removal of a volatile (*i.e.* low boiling component).

Fractional Distillation of an Unknown Mixture

You will be provided with an unknown mixture of two solvents from the list below. The solvents are mutually soluble and differ in boiling point by more than 15^{o}C. You are required to separate the two solvents by fractional distillation, monitoring the temperature at the distillation head (make sure you set your thermometer position correctly) and recording the volume of distillate collected as the experiment proceeds. It is easiest to use a graduated cylinder as a receiver instead of a flask. With the aid of a couple of simple solubility tests you should then be able to identify the two solvents. You will also be required to report the composition of your mixture (*e.g.* 50% solvent A, 50% solvent B).

Some Properties of Common Solvents

Solvent	Boiling Point (760 mm)^{o}C	Density (20^{o}C) g/mL	Solubility in Water
acetone	56.5^{o}	0.7899	∞
chloroform	61.7^{o}	1.4832	δ
methanol	64.7^{o}	0.7914	∞
hexane	68^{o}	0.6603	i
1,1,1-trichloroethane	74^{o}	1.339	i
carbon tetrachloride	77^{o}	1.5940	i
ethanol	78.0^{o}	0.785	∞
cyclohexane	81^{o}	0.779	i
2-methyl-2-propanol	82.2^{o} [25.5]*	0.7887	s
trichloroethylene	87^{o}	1.4642	δ
water	100^{o}	1.0	-
toluene	110.6^{o}	0.8669	i
1-butanol	117.2^{o}	0.8098	δ
tetrachloroethylene	121^{o}	1.6227	i
octane	125-6^{o}	0.703	i

* - m.p. ∞ - infinitely soluble i - insoluble s - soluble δ - sparingly soluble