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NOTE

Binary Systems of Acetone with Chloroalkanes, Benzene, Cyclohexane, Chlorobenzene and Alkanols

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Spectral absorbance of dye indicator for binary mixtures of acetone with chloroalkanes, benzene, chlorobenzene, cyclohexane and various alkanols indicates molecular interactions among these liquids; some of them indicate higher absorbance and others have lower while some do not show no interactions.

Yadav[1] studied viscosity of binary mixtures of 4-methyl-2-pentanones and have observed that the forces operating between unlike molecules seem to be dispersion type. The less negative values of viscosity for the binary mixtures of ketone with benzene show the presence of appreciable forces between two unlike molecules. It appears that polar ketone polarises the aromatic hydrocarbon benzene resulting in an induced dipole moment in it and the resultant forces between unlike pair of molecules are dipole-induced-dipole type[1]. Modi and Desai[2, 3] studied the interactions of chloroalkanes with hexane or heptane by using dye indicator spectral absorbance method. Modi[3] studied the interactions of binary mixtures of diethyl ether with chloroalkanes, benzene, toluene, xylene using indicator spectral absorbance method.

Acetone and chloroalkanes, benzene, chlorobenzene, cyclohexane, alkanols (M/10 concentration solutions) and dye dimethyl yellow (D.M.Y.) (5.0×10^{-5} M concentration solutions) were prepared in petroleum ether (60–80°C). Different sets of solutions were prepared by increasing acetone concentrations while in chloroalkanes, benzene, chlorobenzene, cyclohexane and alkanols, dye dimethyl yellow the concentrations were kept constant and made up to 50 mL with petroleum ether.

A Shimadzu double beam spectrophotometer UV-160 A was used for spectral measurements. Absorbance of pre dye solution at λ_{max} in each set of solutions was measured and plotted against increasing acetone concentrations, the absorbance-acetone concentrations graph indicates peaks corresponding to the ratio of concentration of two liquids in stochiometric proportions.

Acetone interactions with cyclohexane shows one absorbance peak, while with

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chloroform and carbon tetrachloride two peaks; $CHCl_3$ peaks are of equal intensity, but CCl_4 peaks at lower acetone concentration show higher intensity than at higher acetone concentration. One peak of cyclohexane interaction is of H-bond type, oxygen of acetone forming H-bond with aliphatic hydrogen of cyclohexane. Two peaks of acetone interactions with chloroform are of two types: (i) H-bond interaction of oxygen with hydrogen and chloroform, and (ii) highly polar negative chlorine interaction of $CHCl_3$ with positive methyl H-atoms of acetone. In case of CCl_4 it acts as polar in acetone solution and so Cl of CCl_4 induces interaction with —CH_3 groups of acetone. In case of benzene there seems to be no π-electron interactions with acetones, hence no peakis observed. Acetone absorbance interactions with various alkanols *viz.*, methanol, isoproponal and butanol indicate two peaks on absorbance acetone concentration graphs. These interactions are of H-bond type, oxygen of acetone forming H-bond with hydrogen of —OH groups of alkanols. In case of methanol H-bond is stronger because methanol hydrogen has higher electropositive character than that of isoproponal or butanol. However with increasing acetone proportion, such H-bond character increases with butanol but not with isoproponol as there is steric hindrance of two isopropyl methyl groups. Thus this method indicates not only molecular interactions but also molecular evidence of complexing between unlike molecules.

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