Asian Journal of Chemistry Vol. 13, No. 4 (2001), 1652–1654

NOTE

Study of Molar Refraction and Polarizability Constant of 2′-Hydroxy-5′-Methyl-4-Methoxy Chalcone in Different Percentage of Acetone-Water Mixture

A.S. BURGHATE*, P.B. AGRAWAL†, S.W. QUAZI† and M.L. NARAWADE†
Department of Chemistry, J.D.P.S. Mahavidyalaya, Daryapur, India

The refractive indices of acetone-water and 2′-hydroxy-5′-methyl-4-methoxy chalcone-acetone-water in different percentages of acetone-water mixtures were measured by Abbe's refractometer at 27 ± 0.1°C. The data obtained is utilised to calculate molar refraction and polarizability constant and estimate the nature of dipole.

Oswal *et al.*[1] have studied dielectric constants and refractive indices of binary mixtures of ethyl acetate with toluene, ethyl benzene, *o*-xylene, *p*-xylene and *p*-dioxane. The properties of liquid such as viscosity, refractive index and ultrasonic velocity of binary mixtures are studied by many workers[2–7]. Mahajan *et al.*[8] have studied molar refraction and polarizability constant of 2-amino-5-chloro-benzene sulphonic acid in different percentage of dioxane-water mixtures. The present work deals with the study of molar refraction and polarizability constant of 2′-hydroxy-5′-methyl-4-methoxy chalcone (ligand) in different percentages of acetone-water mixtures.

Acetone-water mixtures of varying compositions as well as solutions of ligand in different percentages of acetone-water mixtures were prepared by weight. All weighings were made on Mechaniki Zaktasy Precyzyjnej Gdansk balance made in Poland (± 0.001 g). The accuracy of density measurements was within 0.1% kg m^{-3}. The refractive indices of solvent mixtures and solutions were measured by Abbe's refractometer. The accuracy of Abbe's refractometer was within (± 0.001 units). The temperature of prism box was maintained constant by circulating water from thermostat maintained at 30°C (± 0.1°C). Initially the refractometer was calibrated with a glass piece (n = 1.5220) provided with the instrument.

The molar refractions of solvent, acetone-water mixtures are determined from

$$R_{a\text{-}w} = X_1R_1 + X_2R_2 \quad (1)$$

where R_1 and R_2 are molar refractions of acetone and water respectively.

†Department of Chemistry, Govt. Vidarbha Mahavidyalaya, Amravati-444 604, India.

The molar refraction represents actual or true volume of the substance molecules in 1 mole. The molar refractions of solutions of ligand in acetone-water mixtures are determined from

$$R_{mixture} = \frac{(n^2 - 1)}{(n^2 + 2)} \left\{ \frac{[X_1M_1 + X_2M_2 + X_3M_3]}{d} \right\} \quad (2)$$

where n = refractive index of solutions; X_1 = mole fraction of acetone; X_2 = mole fraction of water; X_3 = mole fraction of solute; M_1, M_2, M_3 = molecular weights of acetone, water and solute respectively; d = density of solution.

The molar refraction of ligand is calculated as

$$R_{lig} = R_{mixture} - R_{a\text{-}w} \quad (3)$$

The polarizability constant (α) of ligand is calculated from the following relation:

$$R_{lig} = 4/3\ \pi N_0 \alpha$$

where N_0 is Avogradro's number.

The values of molar refraction of acetone-water and ligand acetone-water are represented in Table-1. The values of molar refraction and polarizability constant of ligand are given in Table-2. Table-2 shows that with increase in percentage of acetone, the molar refractivity (true molar volume) as well as polarizability constant of ligand decreases. This may be attributed to the fact that the dipole in ligand lies perpendicular to longer axis of molecule and with increase in percentage of acetone, causing decrease in dielectric constant of medium, considerable dipole association takes place which would be accompanied by decrease in polarazibility as well as molar refractivity because of the mutual compensation of dipole.

TABLE-1
MOLAR REFRACTION OF ACETONE-WATER AND LIGNAD-ACETONE-WATER MIXTURES

(%) Acetone	Acetone-water $R_{a\text{-}w}$ $cm^3\ mol^{-1}$	d g/cc	Lig-acetone-water (n)	$R_{mixture}$ $cm^3\ mol^{-1}$
70	8.2296	0.8099	1.370	9.0502
75	8.9793	0.8096	1.366	9.6270
80	9.8744	0.8062	1.360	10.3062
85	10.9617	0.8004	1.365	11.4918
90	12.3106	0.7992	1.365	12.6970
95	14.0285	0.7959	1.364	14.2692

TABLE-2
MOLAR REFRACTION AND POLARIZABILITY CONSTANT OF LIGAND

(%) Acetone	Molar refraction R_{Ligand} cm^3 mol^{-1}	Polarizability constant $\alpha \times 10^{-23}$ (cm^3)
70	0.8227	0.03263
75	0.6476	0.02568
80	0.4318	0.01712
85	0.5300	0.02102
90	0.3863	0.01532
95	0.2407	0.00955

ACKNOWLEDGEMENTS

Authors are very much thankful to Head of Chemistry Department and Principal of Govt. V.M.V., Amravati for providing necessary facilities. Authors are very much thantkul to UGC for awarding teacher fellowship to one of them (A.S.B.).

REFRENCES

1. S.L. Oswal and M.V. Rathnam, *Indian J. Chem.*, **26,** 29 (1987).
2. S.S. Joshi, T.M. Aminabhavi, R.H. Balundgi and S.S. Shukla, *J. Chem. Eng. Data*, **35,** 185 (1990).
3. S.S. Joshi, T.M. Aminabhavi and S.S. Shukla, *Can. J. Chem.*, **68,** 251 (1990).
4. S.S. Joshi and T.M. Aminabhavi, *Fluid Phase Equil.*, **60,** 319 (1990).
5. V.A. Aminabhavi, T.M. Aminabhavi and R.H. Balundgi, *Ind. Eng. Chem. Res.*, **29,** 2106 (1990).
6. M.I. Aralaguppi, T.M. Aminabhavi, R.H. Balundgi and S.S. Joshi, *J. Phys. Chem.*, **95,** 5299 (1991).
7. S.K. Raikar, T.M. Aminabhavi, S.B. Haragoppad and R.H. Balundgi, *Ind. J. Tech.*, **31,** 581 (1993).
8. D.T. Mahajan, Ph.D. Thesis, Amravati University (1997).

(*Received*: 25 April 2001; *Accepted*: 5 September 2001) AJC-2432