

Densities , refractive indices and specific refraction of potassium ferricyanate (III) in acidic media at 29⁰ C

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ABSTRACT

Densities (ρ) and refractive indices (n_D) of potassium Ferricyanate(III) of different concentration (0.1 to 0.8N) aqueous 0.1 M HCL solution were measured at 29⁰C. Specific refraction (RD) were calculated from refractive index and density of solutions. The measured refraction index and density were of calculated using Lorentz and Lorentz formula and andher, desai and joshi's formula on comparison it predict the values were nearly to the Lorentz and Lorentz formula

1.Introduction

Potassium ferricyanate(III) is inorganic compound having formula $K_3[Fe(CN)_6]$. and it is a potassium salt of $[Fe(CN)_6]^{3-}$ ion. It is used for separation of copper from molybdenum ores, purification of tin and as anti-caking agents for road salt and table salt. Potassium ferrocyanide is used for the production of citric acid and wine. Density of solution is an important key thermodynamic property. Using density data of solution the partial molar volumes are calculated. Many workers have carried out molecular interaction studies in solution [1-3] and ion-ion and ion-solvent interactions in electrolyte solutions from partial molar volumes [4-6]. Partial molar volumes of hexaamminecobalt(III) nitrate in proteated and deuterated water has been studied by A. Zanella et al [7]. Studies over the transport properties of tris(hydroxymethyl) aminomethane hydrochloride in 20% (v/v) acetone-water were carried out by A. Dixit [8]. Ion-solvent interactions in ionic solutions of alkali metal chlorides in tetrahydrofuran + water mixture at different temperatures [9], atmospherically important electrolyte solutions [10], magnesium sulphate in formamide + ethylene glycol mixed solvents [11], aqueous solutions of sodium acetate at different temperatures [12], salts of transition metal and magnesium sulphates at different temperatures [13] studies carried out. Density, viscosity, andrefraction index of $Cu(NO_3)_2 \cdot 3H_2O$ in DMSO have been studied by A. K. Mamyrbekova [14].

In aqueous media, $K_3[Fe(CN)_6]$. complex produce $[Fe(CN)_6]^{3-}$ complex ions and K^+ ions. In aqueous 0.1 M HCl solution, H^+ and Cl^- ions will be formed as HCl is strong acid. Study of solvation of $[Fe(CN)_6]^{3-}$ and other ions by water molecules due to ion-solvent interactions is interesting, therefore, in continuation with our interest to study physicochemical properties of solutions [15-19], herein we report changes in density, refractive index and apparent

concentration 0.1 to 0.8 N solutions of potassium hexacyanoferrate(II) trihydrate in 0.1 M HCL at 29⁰C

2.Experimental Section

Aqueous solution of HCL (0.1M) was prepared in calibrated Gravity bottele using distilled water. Experimental solutions of potassium ferricyanate (III) ($M = 329.26$ g/mol) having different molal concentration ($M = 0.1-0.8$ N) were prepared by dissolving required quantites of solid complex in 0.1 M stock solution of HCL in calibrated volumetric flask (50 cm^3).Densities of different solutions were measured using single capillary pycnometer of 10 cm^3 capacity. the pycnometer was calibrated using distilled water at 29⁰C. Weighing was done on electronic balance (Anamed e=0.0001g).Pycnometer with experimental solution was immeres in the water bath for 10 min to attain thermal equilibrium and it was then removed and outer walls were cleaned and weighed.abbes refractometer (Rico Sci.Ind., New Dehli India, RSR-F1; Sr. No-515-2-09; range 1.3000-1.7000; ± 0.0001) was used for the refractive index measurements at experimental temperature. Constant temperature water bath was used for maintaining desired temperature of solutions. Temperature was maintained constant in Abbes mfractormeter by passing water at desired temperature through the water jacket provided with refractometr.

3.Results and Discussion

Experimental data of density , refractive index and calculated apparent molar volumes and specific refraction are reported in Table No.1 Calculated specific refraction were Table no.2

Table No.1-Experimental values of refractive index and density of different molal concentration solution at 29°C.

No	Concentration Solution	Refractive index	Density
1.	0.1	1.359	0.9350
2.	0.2	1.364	0.9549
3.	0.3	1.369	0.9716
4.	0.4	1.373	0.9784
5.	0.5	1.375	0.9988
6.	0.6	1.380	1.0010
7.	0.7	1.383	1.0290
8.	0.8	1.388	1.037

Table No.2- Calculated values of Specific refraction with Lorentz and Lorenz and Andher Desai (ADJ) Formula of different molal solution at 29°C.

No	Calculated Specific Refraction		Differences
	Lorentz and Lorenz (R ₁)	Andher Desai And Joshi (R ₂)	
1.	0.2340	0.7450	0.5110
2.	0.2330	0.7430	0.5100
3.	0.2320	0.7420	0.5100
4.	0.2321	0.7423	0.5100
5.	0.2290	0.7390	0.5100
6.	0.2310	0.7400	0.5090
7.	0.2260	0.7306	0.5040
8.	0.2270	0.7366	0.5090

4.Results and Discussion

Table-1 indicated the experimental values of refractive index and densities where as Table-2 shows the calculated values of specific refraction . it predicts the range between

0.2260 to 0.2340 and the other formula contains the values between 0.7390 to 0.7450.it shows that the values are nearly to the suggested formula.

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