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STUDY OF VISCOSITY OF SUBSTITUTED E 3-(2-PHENYL-IMIDAZO [1, 2-A] PYRIDINE-3YL)-N-(PHENYL) ACRYLAMIDE IN DIFFERENT SOLVENT

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Abstract:-

Substituted E 3-(2-phenyl-imidazo[1,2-a]pyridine-3yl)-N-(phenyl)acrylamide has been synthesized and characterized by M. P., infrared spectroscopy, thin layer chromatography, 1H NMR and mass data. The viscosities of prepared compounds were studied in different solvents acetone-water, ethanol-water, dioxane-water in different percentage. Relative viscosities have been calculated from obtained data. From the relative viscosity the molecular interactions in the solutions were studied and effect of substituent's on viscosity of E 3-(2-phenyl-imidazo [1, 2-a] pyridine-3yl)-N-(phenyl) acrylamide was determined.

Keyword: - Viscosity, molecular interaction, physicochemical properties.

Introduction:-

Physiochemical Properties of compounds provide a very useful tool in elucidating the structural interactions among the components. Viscosity is one of the important physical properties it implies resistance to flow as fluids. It exhibits a characteristic property of flowing under applied force of their own weight. Viscosity measurements have an important role in many fields of both industry and research. Viscosity measurements are one of the most reliable ways to analyze some of the most important factors affecting product performance. Viscosity is studied widely to known about the molecular interaction in solute-solute and solute –solvent [1-3]. In binary mixtures of liquids, the additional forces between molecules are important. The viscosity measurements are easy and simple to carry out. Jone-Dole coefficient and Falkenhagen coefficient are determined using the viscosity measurements. These coefficients are directly related to solute-solute and solute solvent interactions [4].

Viscosity and density of various electrolytes in various mixtures of water with tert. Butyl alcohol and tert. Butyl amine was determined [5]. Density and viscosity studies in ethanol and water system at 301.5K of paracetamol was done by Muktar Shaikh and et al. [6]. Shashikant and Sharma Kamini measured the viscosity of lithium chloride in different composition of lactose in various temperatures 303.15K, 308.15K, 313.15K and 318.15K [7]. Viscosity and density for the binary liquid mixture of dimethyl sulfoxide with benzene, ethyl benzene, chlorobenzene and bromobenzene system were determined as a function of mole fraction at atmospheric pressure and at a temperature of 303.15 K, 308.15 K and 313.15 K[8]. Density and viscosities for the binary mixtures of 1,4-dioxane and benzene or chlorobenzene at 303.15, 308.15 and 313.15 K was studied [9]. The addition of organic solvent to the aqueous solution of electrolyte brings a change in ion-solvent and reactivity of dissolved electrolyte.[10-11] In the present work I have studied the viscosity, relative viscosity in order to discuss solute-solvent interactions and effect of substituent's on viscosity of E 3-(2-phenyl-imidazo[1,2-a]pyridine-3yl)-N-(phenyl)acrylamide.

Experimental:-

Synthesis of of E 3-(2-phenyl-imidazo[1,2-a]pyridine-3yl)-N-(phenyl)acrylamide (Comp.I), (E) N-(4- methoxyphenyl)-3(2-phenylimidazo [1,2-a] pyridine-3yl)-N-(phenyl) acrylamide (Comp.II), (E)-3-(2-(4-methoxyphenyl) imidazo [1,2-a] pyridine-3-yl)-N-phenyl acrylamide (Comp.III), (E) N-(3,4-dimethoxyphenyl)-3-(2-(4 methoxyphenyl) imidazo[1,2-a]pyridin-3yl)acrylamide (Comp.IV), (E)-3-(2-(4-methoxyphenyl)imidazo [1,2-a] pyridine-3-yl)-N-(p-tolyl)acrylamide (Comp.V), was done by known method and structures of these compounds were confirmed by IR, NMR, mass, spectral data. The solvents used were AR grade and doubly distilled water was used. Densities of compound solutions and solvents were determined by bicapillary pyknometer. The viscosities were determined using Ostwald's viscometer. 0.01 M solutions of compound in different percentages of solvent were prepared (70, 80, 90, and 100 %) of ethanol-water, acetone-water and dioxane-water. Viscosities were measured at room temperature 297K.

Results and Discussion

The viscosity of each solution of compounds prepared is determined by the following empirical formula

$$n_r = d_s \times t_s / d_b \times t_b$$

Where n_r is relative viscosity of compound solution, d_s is density of compound solution, t_s is time of flow for compound solution, d_b is density of solvent and t_b is time flow of solvent. In the present investigation the relative viscosities in different solvent are shown in table 1-3. From the experiment it is observed that relative viscosity increases with decrease in the percentage of acetone, dioxane & ethanol. The increase in viscosity may be due to increase in molecular interactions between solute and solvent. The viscosity increases as the number of solute particles lie across the fluid stream lines and are subjected to torsional force [12-13]. Viscosity data of substituted E 3-(2-phenyl-imidazo [1, 2-a] pyridine-3yl)-N-(phenyl) acrylamide (Comp. I to V) in different solvent at different percentage are shown in the following tables.

Table-1

Acetone-water mixture

Percentage of acetone	Relative viscosity at 297K				
	Comp. I	Comp. II	Comp. III	Comp. IV	Comp.V
70	1.2350	1.2411	1.2520	1.2730	1.2360
80	1.2115	1.2230	1.2278	1.2412	1.2150
90	1.1729	1.1820	1.1835	1.1923	1.1750
100	1.1012	1.1125	1.1158	1.1205	1.1085

Table-2

Dioxane-water mixture

Percentage of acetone	Relative viscosity at 297K				
	Comp. I	Comp. II	Comp. III	Comp. IV	Comp.V
70	1.1012	1.1185	1.1265	1.1446	1.1035
80	1.0926	1.1005	1.1033	1.1250	1.0955
90	1.0085	1.0625	1.0825	1.1025	1.0125
100	0.7270	0.8515	0.9526	1.0065	0.8275

Table-3

Ethanol-water mixture

Percentage of acetone	Relative viscosity at 297K				
	Comp. I	Comp. II	Comp. III	Comp. IV	Comp.V
70	1.1462	1.1542	1.1825	1.1952	1.1565
80	1.1235	1.1322	1.1536	1.1625	1.1260
90	1.1011	1.1140	1.1280	1.1450	1.1058
100	1.0065	1.0658	1.1020	1.1170	1.0140

Viscosity of compounds in different solvent are observed as, highest viscosity is observed in acetone-water mixture, then in ethanol-water mixture and least viscosity is observed in dioxane-water mixture. It can be concluded from observation that there is more interaction between compound and solvent in acetone water mixture and least interaction in dioxane-water mixture. The highest viscosity is observed in compound IV and least in compound I the viscosity order of compound is IV>III>II>V>I.

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