



**Comparative Study of Free Volume And Permeability Coefficient of Solutions of N-Acetyl-L-Cysteine in Ethanol-Water (1:4) System Across Cellulose Acetate Membrane At Various Temperatures**

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**ABSTRACT**

*Ultrasonic velocity has been measured in solutions of N-Acetyl-L-cysteine in ethanol-water (1:4) system at 6.0 MHz and at a temperature 308.15 K. The results are discussed in terms of different theories of propagation of ultrasonic waves. From the velocity, density and viscosity data values, various acoustical parameters namely, adiabatic compressibility( $\beta_{ad}$ ), intermolecular free length( $L_f$ ), free volume( $V_f$ ), relaxation time( $\tau$ ), and specific acoustic impedance( $Z$ ) have been calculated. The values of free volume ( $V_f$ ) so obtained were correlated with permeability coefficient ( $L_p$ ) values of these aqueous solutions through cellulose acetate membrane at three different temperatures(303K, 308K, 313K). All these parameters have been discussed separately to throw light on the molecular association and structural reorganization between the amino-acid, alcohol and water molecules. The permeability coefficient ( $L_p$ ) has been found to be independent of the hydraulic pressure but is a characteristic property of the membrane and depends on the concentration of the solute. The results showed that both permeability coefficient ( $L_p$ ) and free volume ( $V_f$ ) increases with increase in concentration and the data is found to be in accordance with their observed density ( $\rho$ ) and viscosity ( $\eta$ ) data.*

**Keywords:** Ultrasonic velocity, structural reorganization, relative association, permeability coefficient, cellulose acetate membrane, activation parameters.

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