_____

Acoustical parameter of polyvinyl alcohol

Richa Saxena[*1] and S C Bhatt[2]
1. IFTM University, Lodhipur, Rajput, Moradabad-244001, (Uttar Pradesh) India
2. Ultrasonic and Dielectric Laboratory, Department of Physics, H.N.B. Garhwal University, Srinagar—246174, Garhwal (Uttarakhand) India
***Corresponding author:** saxena.richa23@gmail.com

_____

Abstract
Density, viscosity and ultrasonic velocity studies has been carried out in aqueous solution of poly vinyl alcohol at 1 MHz frequency. Measurements were carried out in temperature 30ºC at concentration 1.0%, 0.8%, 0.6%, 0.5%, 0.4% and 0.3%. From these acoustical parameter acoustic impedance have been calculated by using measured values of ultrasonic speed, density and viscosity.

Key words: polyvinyl alcohol, Density, viscosity, ultrasonic velocity

INTRODUCTION

In recent years study of intermolecular interactions through ultrasonic investigations plays an imperative role in the growth of molecular sciences. The ultrasonic studies of liquid mixtures have of great significance in understanding intermolecular interactions between the component molecules as they can locate numerous applications in industrial and technological processes (Acharya S. et. al, 2003; Ali A et. al., 2004). The study of propagation of ultrasonic waves in liquid mixtures is one of the simple and effective tools to determine physio- chemical behavior of the liquid. They also provide substantial information on the process involving polymer production and their uses (Beth A M C, 2003). Chee has suggested that the viscosity of the blend solutions can be used for finding out miscibility (Chee K.K.1990)..Jayakumar S.et. al.(Jayakumar S,2015) have studied the molecular association of Polyvinyl Alcohol at 303K. M. Vigneswari et. al.(M. Vigneswari,2016) have studied the molecular interactions in solutions of Polyvinyl alcohol.

MATERIALS AND METHODS

In the present investigation polyvinyl alcohol in solid form of molecular weight approximately 140,000 is used. The solutions were prepared by adding known volume of polyvinyl alcohol to fixed volume of water and stirring under reflex, until a clear solution was obtained. The concentration range studied in the solution is 0.3%- 1.0% (m/v).acoustical parameter acoustic impedance is calculated at different concentration like 1.0%, 0.8%, 0.6%, 0.5%, 0.4% and 0.3%

and at temperatures 30ºC at 1MHz frequency by using variable path ultrasonic interferometer. The temperature of the solution has been kept constant by circulating water from the thermostatically controlled (±0.1^{0}C) water bath. The densities at different temperatures were measured using 10ml specific gravity bottle and single pan macro balance. The viscosity of the mixtures was determined by using Ostwald's viscometer. These parameters are calculated by using standard relations (Richa Saxena et. al.2017).

Table-1: Density(x10^{3}kg/m^3), Viscosity (x10^{-1}Pa.s), Ultrasonic velocity (m/s) and Acoustic impedance (x10^{3}kgm^{2}s^{-1}) of polyvinyl alcohol (PVA) at 30^{0}C temperature and at different concentration at 1 MHz frequency-

Concentration	Density at 30^{0}C	Viscosity at 30^{0}C	Ultrasonic velocity at 30^{0}C	Acoustic impedance at 30^{0}C
1%	1.02	0.094	1514.1	1589.7
0.8%	0.987	0.091	1511..3	1485.1
0.6%	0.985	0.088	1508.6	1482.3
0.5%	0.982	0.085	1503.2	1478.3
0.4%	0.979	0.081	1497.4	1475.2
0.3%	0.975	0.079	1492.6	1462.4

RESULT AND DISCUSSION
In the present work density, viscosity and ultrasonic velocity have been measured at 30^{0}C temperature and 1.0%, 0.8%, 0.6%, 0.5%, 0.4% and 0.3% concentration of polyvinyl alcohol, which is shown in Table-1. By using these values for PVA, acoustic impedance is calculated by using well known relations and the results have been presented in Table-1. The variations of these parameters with temperature and concentration have been shown in Fig.1-Fig.4 respectively. It is found that density, viscosity, ultrasonic velocity and acoustic impedance increases with increase in concentration of PVA.
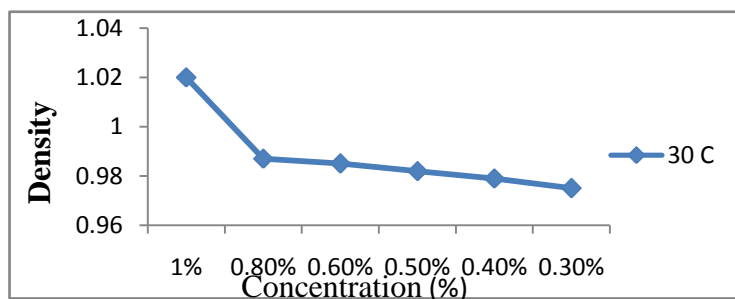

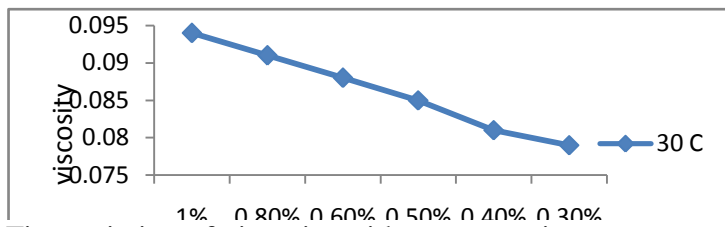Fig1: variation of density with concentration
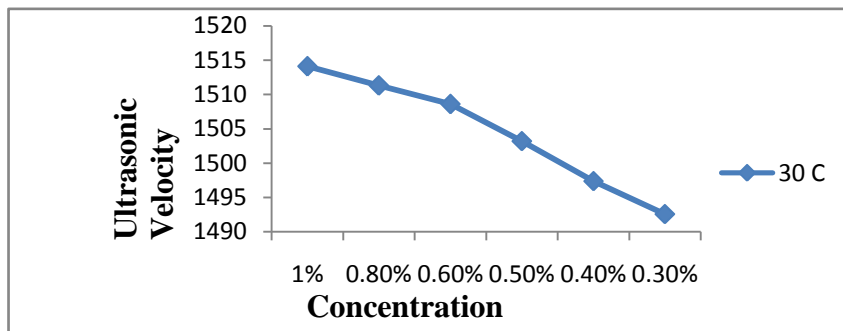
Fig: variation of viscosity with concentration

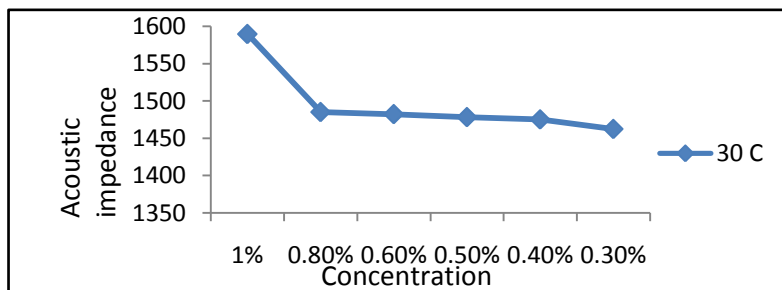Fig3 : variation of ultrasonic velocity with concentration

Fig4: variation of acoustic impedance with concentration

REFERENCES
1. Acharya S, Palikray, R Mohanty, G C (2003) Indian J. of Pure and Applied Physics, 41, 2003, 855-857.
2. Ali A, Abida A (2004) J. Chinese ChemSoci, 5, 477-485.
3. Beth A M C and Jack L K (2003) prog. Polymer sci., 28, 1223.
4. Chee k. k.(1990),European Polymer Journal, 26, 4238.
5. Jayakumar S, Preetha Mary George, Shubhashree N S, Divya P, M Anees Ahmed (2015), International Journal of Innovative Research in Science, Engineering and Technology,4, ,112.
6. M. Vigneswari, S S Saravanakumar, V N Sureshbabu, S Sankarrajan (2016) International J of Advanced Chemistry4, 15.

7. Richa Saxena and S C Bhatt(2017), Rasayan J of Chemistry,10,1340-1347.