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Numerical, Acoustic and Molecular Interaction Studies of Holy Liquids

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ABSTRACT

Study of wave propagation through a material will enable us to study the nature of the material at microscopic level. Wave propagation through liquid and solid helps to analyse its molecular properties. Wave interaction parameters act as an important tool in deciding the applications of the material. The study of wave propagation through liquids and solids and also helped to learn about various methodologies used for analyzing these data. The present study explains about the analysis made in the study of various liquids that are used in Hindu temples as a traditional practice. The density of normal water and water kept for one week in plastic, copper and brass containers were determined and the effect of metallic containers is studied. Also theerthaparimalam (holy liquid used in Hindu temples) solutions are prepared for different concentrations and various physico-chemical properties like density, viscosity and ultrasonic velocity are determined. Using these values, molecular interactions of theerthaparimalam (holy liquid) are studied knowing the interaction parameters like adiabatic compressibility, free length, etc and the results are interpreted by comparing with that of pure ordinary water

Key Words: Adiabatic compressibility, Free length, Holy liquid, Theerthaparimalam

INTRODUCTION

"Theertham", the holy water used during the pooja to wash the idol is not plain water cleaning the dust off an idol. Washing the idol is to charge the water with the magnetic radiations thus increasing its medicinal values. Besides, the clove essence protects one from tooth decay, the saffron & ''Tulsi'' leafs protects one from common cold and cough, cardamom and ''Pachha Karpuram'' (benzoin), act as mouth fresheners. It is proved that ''Theertham'' is a very good blood purifier, as it is highly energized. Hence it is given as ''prasadam'' to the devotees. Water stored in metals like copper, brass or silver will decrease the heat in body and helps the body to absorb essential salts and nutrients. Copper is vital nutrient for body in production blood along with Iron. According to Ayurveda, water stored in a copper vessel has the ability to balance all the three doshas in your body, (vata, kapha and pitta) and it does so by positively charging the water. By drinking this Tulsi water the taste sense is activated. The other benefits of drinking Tulsi water from a copper or silver vessel also includes cure for soar throats, fever & common cold, Coughs, respiratory disorder, Formation of kidney stone, heart disorder chances will be reduced. Molecular interactions of liquids and liquid-liquid mixtures have been reported by many researchers [1-12]. To analyse the effect of specific metals on various types of holy liquids, the effect of density and ultrasound velocity is studied on normal water and water kept in plastic, copper and brass for one week and two weeks respectively. The effect of these parameters on normal water is compared with theerthaparimalam water prepared under different concentrations.

EXPERIMENTAL DETAILS

In the present investigation, the ultrasonic velocities (U) of the liquids are measured by single frequency ultrasonic interferometer at a frequency of 2MHz (Mittal Enterprises Model F-81, ± 0.01 m/s accuracy). The relative viscosity of the solutions are studied at 303K for 1%, 3%, and 5% concentrations using Brookfield viscometer [accuracy ±0.01cP]. The densities are measured using 10ml specific gravity bottle and single pan macro balance (uncertainty ±0.01 kg/m^3). Refractive index studies were performed using Mittal make Abbe Refractometer (uncertainty ± 0.5%). The temperature of viscometer, interferometer and refractometer were main-

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tained at 303K by circulating water from a thermostat with a thermal stability of ± 0.05K.

RESULTS AND DISCUSSIONS

Density, Viscosity and Velocity Studies

Density, viscosity and ultrasonic velocity increases linearly with the concentration of theerthaparimalam water. But the density and viscosity of pure water is low compared to theerthaparimalam water at different concentrations (1%, 3% and 5%) as seen from table 1. The value of ultrasound velocity in pure water is greater than theerthaparimalam (holy water) solution which is due to the increase in the density of theerthaparimalam water at higher concentration. Thus the effect of concentration of theerthaparimalam in water is clearly observed.

Molecular Interaction Analysis of Holy Liquid

The molecular interaction parameters like adiabatic compressibility, inter molecular free length, absorption coefficient and relaxation time of Theerthaparimalam sample are analysed. It is observed that the values of all these parameters are found to be less than normal water for various concentrations taken for study. Decrease in adiabatic compressibility (β) denotes that the molecules of theerthaparimalam are closely packed. Adiabatic compressibility decreases with increase in the concentration of Theerthaparimalam liquid mixture. This indicates that the ionic repulsion will be more in the case of theerthaparimalam solution at higher concentration. The intermolecular free length (L_f) is the mean distance between the surface of neighboring molecule and it also reflects the same trend as that of β. This indicates significant interaction between solute and solvent molecules. The free length of theerthaparimalam water is found to be less than that of normal water. The decrease in the free length may due to gain of dipolar association, making strong hydrogen bond in the molecules of the liquid mixture. But as concentration of theerthaparimalam increases, free length decreases thereby indicating the presence of a very strong molecular interaction. The classical absorption is a sum of shear viscosity and thermal conductivity contributions. The classical absorption coefficient of pure water is more than that of theerthaparimalam water for all concentrations. But as concentration of theerthaparimalam increases, absorption coefficient also increases linearly. Absorption process is due to structural relaxation. These structural relaxation processes play very important role in the study of molecular and structural properties of the component molecules in liquid mixtures. This means that there is less structural relaxation in theerthaparimalam liquid than in normal water. Decrease in ultrasonic absorption with decrease in molar concentration in this liquid system is due to more stability of theerthaparimalam in this liquid system. Increase in relaxation time increases the ultrasonic absorption in the liquid system. Viscous relaxation is caused by the energy transfer between translational and vibrational degrees of freedom. Its behavior depends on viscosity and adiabatic compressibility of the liquid mixture. The relaxation time increases linearly with increase in the concentration of theerthaparimalam. But its value is less than that of normal water. As viscosity increases, viscous relaxation time also increases. From the above result, it is seen that there exists a strong molecular association between the components of theerthaparimalam mixture than at normal water due to dipole-dipole interactions, which varies with density and the change in the frequency of the ultrasonic wave. Thus it is understood that therthaparimalam liquid mixture is found to exhibit various qualities like strong interaction, less absorption and have strong ionic repulsion. These superior qualities may be making theerthaparimalam liquid to be considered as a holy water, and hence they are used at temples.

Comparative Analysis of Interaction Parameters

Viscosity, density, ultrasonic velocity and refractive index are determined for pure water. Then this water is stored in three different containers namely plastic, copper and brass. After one week of storage time, all these parameters are estimated. Again after a week (total storage time is two weeks), all these parameters are determined. Table 3 gives a comparative analysis of various wave interaction parameters of water stored in different containers (plastic, copper, brass) for different time intervals.

Water kept at brass material and copper material show increase in the values of viscosity, density and velocity than normal water when kept in a container for observation upto 2 weeks. It is understood that the minerals of metal container mixes with water to develop a magnetic/special (holy) effect. Also, the optical property (refractive index) of the water stored in copper/brass containers is enhanced. These may be one of the probable reasons for using copper/brass containers to keep holy liquids at temples. Water kept at plastic container for two weeks also show increase in the values of various parameters but this may be due to contamination.

CONCLUSIONS

From the knowledge of velocity, viscosity and density, various molecular interaction parameters like adiabatic compressibility, free length, free volume, internal pressure, etc are determined.

Lower values of adiabatic compressibility show that the molecules of Brass container are closely packed. Lower values of free length indicate the presence of strong molecular interaction for brass than copper. Absorption process is due to structural relaxation. These structural relaxation processes play very important role in the study of molecular and structural properties of the component molecules in liquid mixtures. This means that there is less structural relaxation for normal water kept in brass container than other containers. Decrease in ultrasonic absorption of the liquid system in brass container is due to more stability.

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Table 1: Density, Viscosity & Velocity of Theerthaparimalam at different concentrations

System	Conc. in % (gm/dl)	Density Kg/m³	Relative viscosity (cP)	Ultrasonic Velocity (m/s)
Theertha parimalam	1	0.991	0.99	1463.66
	3	0.999	1.02	1471.47
	5	1.005	1.06	1481.22
Pure water		0.988	0.97	1510.00

Table 2: Comparison of molecular interaction analysis of holy liquid with normal water

System	Conc. in % (gm/dl)	Adiabatic compressibility ($x 10^{-7} m^2 N^{-1}$)	Inter-molecular free length ($x 10^{-9}$ m)	Absorption Coefficient ($x 10^{-9}$) $s^2 m^{-1}$	Relaxation time ($x 10^{-7}$ s)
Theertha parimalam	1	4.62587	1.44937	8.37662	6.21756
	3	4.61384	1.44749	8.42575	6.28739
	5	4.58065	1.44227	8.53315	6.40973
Pure water		5.04082	1.51298	9.40716	6.67878

Table 3: Comparison of interaction parameters of water kept in different containers for different time intervals

Various Parameters	Pure water	After I Week			After II Weeks		
		Plastic	Copper	Brass	Plastic	Copper	Brass
Density	1074.3	1076.7	1075.7	1075.1	1113.5	1112.9	1115.7
Viscosity	1.02	1.02	1.03	1.04	1.02	1.04	1.06
Velocity	1496.18	1478.26	1494.97	1494.36	1497.38	1496.78	1498.00
R.I	1.341	1.341	1.345	1.345	1.341	1.347	1.346

Table 4: Molecular interaction analysis of water stored in different containers

Parameter	Instant Pure water	Plastic		Copper		Brass	
		I Week	II Week	I Week	II Week	I Week	II Week
Adi. Comp.	4.15E-10	4.25E-10	4.01E-10	4.15E-10	4.01E-10	4.16E-10	3.99E-10
Free Length	4.34E-11	4.39E-11	4.26E-11	4.34E-11	4.26E-11	4.34E-11	4.25E-11
Abs. Coeff.	7.4534	7.7104	7.1736	7.5349	7.1862	7.6215	7.431
Relax. Time	5.6552	5.7801	5.4473	5.7124	5.4546	5.7757	5.6451
Impedance	1607340.8	1591646.8	1667337.0	1608136	1665765.3	1606590.7	1671318.6