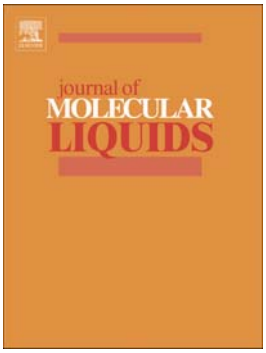

Molecular interactions in silicone rubber- nano hydroxyl apatite system in solution phase probed by ultrasonic technique

M. Bindu, J. Janisha, J. Hemalatha, G. Unnikrishnan

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Molecular interactions in silicone rubber- nano hydroxyl apatite system in solution phase probed by ultrasonic technique

Bindu M[a], Janisha J[a], Hemalatha J[b], Unnikrishnan G[a*]

[a]Dept. of Chemistry, National Institute of Technology, NIT Campus, Calicut- 673601, Kerala, India.

[b]Dept. of Physics, National Institute of Technology, Thiruchirappalli- 620015,Tamilnadu, India.

*Corresponding author. Tel.: 04952285302, 09846764238, E-mail address: unnig@nitc.ac.in

Abstract

Ultrasonic investigations have been carried on the solutions of silicone rubber (SR) - nano hydroxyl apatite (n-HA) systems at an operating frequency of 2 MHz. Ultrasonic velocity (v), density (ρ) and refractive index (n) have been examined for the solutions of SR (average molecular weight = 1, 28,000 g/mol) and those of SR- n HA in toluene and xylene. The 'v' value has been found to be increased with increase in concentration of SR in the solvents. For a given SR content, the 'v' value has been observed to be higher for toluene than xylene. The results have been interpreted in terms of closer solubility parameter values. With the addition of n- HA, the 'v' increases for a given SR content and solvent. This has been accounted in terms of better molecular interaction being developed in the medium with the incorporation of n- HA. Various acoustical parameters such as adiabatic compressibility, acoustic impedance, Rao's constant, van der Waals constant and space filling factor have been computed to complement the observations. The observations on SR/ n-HA systems is proposed for utilization in the encapsulation of drugs, for controlled release, under ultrasound stimulation.

Key words: Ultrasonic velocity; Silicone rubber; nano- Hydroxyl apatite; Refractive index; Density; Adiabatic compressibility

1. Introduction

Ultrasonic studies on polymer solutions have, by now, gained a lot of attention [1-4]. The sound velocity measurements in polymer solutions furnish impressive knowledge about polymer- polymer and polymer- solvent interactions, which are of greatest importance for processes involving polymer product development and their industrial applications [5-8]. Adiabatic compressibility and internal pressure, the functions of ultrasonic velocity, are prominent factors indicating molecular interactions in solutions, including hydrogen bonding [9-13].

Many interesting examinations related to ultrasonic studies on polymer solutions are available in literature. Typically, Bhatt et al [14] highlighted that the evaluation of propagation of ultrasonic