The speeds of sound ($u$) have been measured at 298.15 K and atmospheric pressure, as a function of composition for seven binary liquid mixtures of propylamine ($\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$, PA) + ethylene glycol monomethyl ether (2-methoxyethanol, $\text{CH}_3(\text{OC}_2\text{H}_4\text{OH}$, EGMME); + diethylene glycol monomethyl ether [2-(2-methoxyethoxy)ethanol], $\text{CH}_3(\text{OC}_2\text{H}_4)_2\text{OH}$, Di-EGMME]; + triethylene glycol monomethyl ether [2-(2-(2-methoxyethoxy)ethoxy) ethanol], $\text{CH}_3(\text{OC}_2\text{H}_4)_3\text{OH}$, Tri-EGMME]; + diethylene glycol monooctyl ether [2-(2-ethoxyethoxy)ethanol, $\text{C}_2\text{H}_5(\text{OC}_2\text{H}_4\text{OH}$, Di-EGMEE]; + diethylene glycol monobutyl ether [2-(2-butoxyethoxy) ethanol, $\text{C}_4\text{H}_9(\text{OC}_2\text{H}_4\text{OH}$, Di-EGMBE]; + diethylene glycol diethyl ether [bis(2-ethoxyethyl)ether, $\text{C}_2\text{H}_5(\text{OC}_2\text{H}_4)_2\text{OC}_2\text{H}_5$, DEGDEE]; and + diethylene glycol dibutyl ether [bis(2-butoxyethyl) ether, $\text{C}_4\text{H}_9(\text{OC}_2\text{H}_4)_2\text{OC}_4\text{H}_9$; DEGDBE] using a Nusonic velocimeter based on the sing–around technique. These values have been combined with densities derived from excess molar volumes to obtain estimates of the molar isentropic compressibility $K_{S,m}$, and their excess values $K_{E,m}$. The $K_{E,m}$ values are shown to be negative for all mixtures over the entire composition range. The deviations $u^D$ of the speeds of sound from the values calculated for ideal mixtures have been obtained for all estimated values of mole fraction $x_1$. The change of $K_{E,m}$ and $u^D$ with composition and the number of –OC$_2$H$_4$ – units in the alkoxyethanol are discussed with a view to understand some of the molecular interactions present in alkoxyethanol – propylamine mixtures. Also, theoretical values of the molar isentropic compressibility of...
and of the speed of sound $u^D$ have been calculated using the Prigogine-Flory-Patterson (PFP) theory with the van der Waals (vdW) potential energy model, and the results have been compared with experimental values.

**KEY WORDS:** alkoxylthanol; polyether; propylamine; speeds of sound.

1. INTRODUCTION

In previous papers [1,2] we have reported excess molar volumes of alkoxylthanol and polyethers with propylamine at 298.15 K. These results suggested that there exist specific interactions between an amine and an alkoxylthanol or polyether, and the results were influenced by intermolecular association of both the amine and alkoxylthanol molecules. Since the study of speeds of sound and isentropic compressibility in binary liquid mixtures are of considerable interest [3–6] in assessing the nature of molecular interactions and investigating the physicochemical behavior of liquid systems, we have performed measurements of the speed of sound for these mixtures in order to evaluate various thermodynamic properties and functions that give a better understanding of the molecular interactions existing between alkoxylthanol or polyethers and amines. Hence, we report here measured values of speeds of sound for mixtures containing propylamine and either ethylene glycol monomethyl ether, diethylene glycol monomethyl ether, triethylene glycol monomethyl ether, diethylene glycol monoethyl ether, diethylene glycol monobutyl ether, diethylene glycol diethyl ether, or diethylene glycol dibutyl ether at 298.15 K. The isentropic compressibilities $\kappa_S$ for all mixtures were estimated by combining the densities derived from excess molar volumes [1,2] and the speeds of sound. The molar volumes were multiplied by the isentropic compressibilities to obtain estimates of the product $K_{S,m}$. We have calculated the deviation of the speeds of sound $u^D$ from those of ideal mixtures $u^{id}$, together with the excess molar quantities $K_{S,m}^E$. Also, the theoretical values of molar isentropic compressibility $K_{S,m}$ and speed of sound $u$ have been estimated in the Prigogine-Flory-Patterson (PFP) theory applying the van der Waals (vdW) energy model.

2. EXPERIMENTAL

Ethylene glycol monomethyl ether was obtained from S.-D. Fine Chemicals, AR grade, and was dried and fractionally distilled [7]. The sources and purities of other liquids used have been described in our earlier papers [1,2,8]. All samples were kept in tightly sealed bottles to