PREFACE

Society and public powers are increasingly conscious of the fact that economic development cannot be carried out without the cost. However, development must be allowed without putting at risk the survival or human kind itself on the earth. In other words, it is necessary that development should be sustainable. This is true in all the ambits and more in the industrial one which is specially affected by development. Chemical industry, in this sense, is not different from others. One of the aspects of this industry that has a more negative impact on sustainability is that referred to the environmental contamination. Consequently need for sustainable environmentally friendly energy resources, such as solar energy and use of different types of vegetable oils or biodiesel as substituted of diesel fuel has considerably increased in the last decade. In solar thermal systems, heat transfer liquid or liquid mixture is required for the circulation of heat and thus the efficiency of thermal systems depends on the thermodynamic properties of liquid or liquid mixture. Further, thermodynamic properties of vegetable oils or biodiesel + diesel fuel liquid mixtures are required for exploring possibility to substitute vegetable oil or biodiesel as a fuel.

Thermodynamic properties like excess molar volumes, excess molar enthalpies, excess isentropic compressibilities, excess Gibbs free energy and excess heat capacities of liquids mixtures are widely used in chemical industries for the right design of several types of industrial equipments and many industrial applications like design calculation, heat transfer, fluid flow etc. These properties are used to test the applicability of different models and theories, comparing their predictions with experimental data and also provide information about the nature and extent molecular interactions existing in liquid mixtures. Cyclic ethers represent a class of technically important compounds frequently used as solvents in the chemical industry. 1, 3-dioxolane, tetrahydropyran and 1, 4-dioxane are excellent aprotic solvents, soluble in all proportions with water, alcohols, ethers and all common solvents. They are used as a good solvent for plastics, resins and polymers, a dispersing agent for textile processing, and a reaction medium solvent in organic and biological processing. They are also added to gasoline to improve octane number and reduce pollution. Mixtures composed of cyclic ether and aromatic hydrocarbons or cyclo or n-alkanes comprise a substantial portion of liquid mixtures of practical importance. Anilines (aniline, N-methylaniline, o-toluidine) are known to be associated in pure state through hydrogen bonding. The addition of anilines to cyclic ether like 1, 3-dioxolane or 1, 4-dioxane or tetrahydropyran may rapture or enhance the self association of anilines or

cyclic ethers which would reflect change in their respective topology, It was thus worthwhile to measure thermodynamic properties of binary (1, 3-dioxolane or 1, 4-dioxane or tetrahydropyran + aniline or N-methyl aniline or o-toluidine) mixtures and analyze the observed thermodynamic data in terms of Graph theory (which deals with the topology of a molecule) to extract information about the state of components in pure and mixed state along with nature and extent of interactions operating among the constituents of mixtures. The observed thermodynamic have also been analyzed in terms of Prigogine-Flory-Patterson (PFP) and Sanchez & Lacombe theories to gain insight about the molecular interactions in mixtures.

The numbers of studies on ternary mixtures have increased recently due to industrial applications and theoretical interest in studying the nature of molecular interactions and packing phenomenon among the constituents. This has promoted researchers to measure thermodynamic properties of ternary mixtures. Further, in comparison to large data available in the literature for thermodynamic properties of binary mixtures containing cyclic ether as one of the component, the experimental data for ternary mixtures are limited. It was therefore of interest to measure thermodynamic properties excess molar volumes and excess molar enthalpies of ternary {1, 3-dioxolane or 1, 4-dioxane (i) + aniline (j) + benzene or toluene (k); 1, 4-dioxane (i) + o-toluidine (j) + benzene or toluene or m- or p-xylene (k)} mixtures. An attempt has also been made to obtain expression in terms of connectivity parameters of third degree of a molecule (which in turn deals with its topology) for predicting excess molar volumes and excess molar enthalpies of the investigated ternary mixtures. The observed thermodynamic for ternary mixtures have also been analyzed in terms of PFP and Sanchez & Lacombe theories.