A B S T R A C T

The earlier works on the correlations developed for the viscosity and density of liquids and liquid mixtures were reviewed. Viscosities and densities of selected ternary liquid mixtures and their constituent binaries showing wide range of non-ideality with one or more of the components as either weakly polar, strongly polar or associating were experimentally determined at 30,40,50 and 60°C. The correlations of viscosity -composition-temperature data for binary as well as ternary mixtures using pure component properties only have been tried following the equation based on significant liquid structure theory of Eyring and the needed pure component parameters forming the mixed liquid systems were also evaluated. Mixture viscosity-composition-temperature data for the selected ternary and binary liquid mixtures studied have also been correlated by a McAllister type equation based on three-body interactions and the needed interaction parameters were evaluated for the mixed liquid systems studied and found to depend on temperature and nature of the pure components involved. Other equations for correlating viscosity-composition-temperature data for binary as well as ternary mixtures were of the polynomial type. On comparing the average root mean square deviations in calculated viscosity-composition-temperature data, it was concluded that the equation based on significant liquid

structure theory can be safely used for predicting binary as well as ternary viscosity - composition - temperature data available. However, when sufficient experimental mixture viscosity data for binary as well as ternary are available for evaluating the interaction parameters, suitable polynomial equations may be profitably used for interpolation and limited extrapolation of data inspite of the fact that they involve several adjustable parameters. For correlating density-composition - temperature data for binary as well as ternary mixtures using pure component properties only, the equations based on multifluid model have been employed and the needed parameters were evaluated for the pure components forming the mixed liquid systems. The addition of an adjustable ternary mixture parameter on multifluid model was also studied. Other equations for correlating density-composition-temperature data for binary and ternary mixtures were of the polynomial type. On comparing the average root mean square deviations in calculated mixture density - composition - temperature data, it was found that equation based on multifluid model can be safely used for predicting binary as well as ternary density-composition-temperature data when experimental mixture density data are not available. When sufficient experimental mixture density data for binary as well as ternary are available modified multifluid model equation or suitable polynomial equations may be used for interpolation and limited extrapolation of data.

Free energies, enthalpies and entropies of activation of viscous flow were evaluated from measured mixture viscosities and densities in the temperature range 30 to 60^{o}C for all the ternaries and their constituent binaries. The variations of these thermodynamic quantities with the nature and concentrations of the pure components in the mixture were also discussed.

The experimental measurements made and the data analysis performed were considered useful for the purposes of process design and development work.