

**A Comparative Study of The Thermodynamic Properties  
of Aqueous Solutions of 2,3-Pyridyl and Piperidine Methanols**

Ismail Kul<sup>C,S</sup> and Krishna Bhat

*Widener University, Department of Chemistry and Biochemistry, Chester, PA, U.S.A.*

*ikul@widener.edu*

Megan Hums and Michael R. Miller

*Widener University, Department of Chemical Engineering, Chester, PA, U.S.A.*

This research was designed to examine a comparative study of the thermodynamic properties of aqueous solutions of 2,3-pyridyl and piperidine methanols. The density and excess volumes of mixing as a function of temperature ( $T = 293.15\text{-}318.15\text{ K}$ ) over the entire concentration range are investigated for aqueous solutions of 2,3-pyridyl methanols, and the density and partial molar volumes of aqueous solutions are investigated for 2,3-piperidine methanols. The minimum values,  $-0.59\text{ cm}^3/\text{mole}$  for 2-pyridylcarbinol-water solutions and  $-0.47$  for 3-pyridylcarbinol-water solutions, are observed. These are about 0.61% and 0.49 % respectively, of the molar volume. The thermal expansion coefficients  $\alpha_T$  at selected temperatures calculated from the density studies, exhibited significant positive deviations, (about 82% , and 47%) from ideality for 2-pyridylcarbinol-water mixtures, and 3-pyridylcarbinol-water mixtures, respectively. The partial molar volume of 2,3- piperidine methanols in water at selected temperatures was evaluated by extrapolating the apparent molar volume versus molality plots to  $m=0$ . In addition, the partial molar expansivity,  $E^o$ , the isobaric coefficient of thermal expansion,  $\alpha_T$ , the interaction coefficient,  $S_{12}$ , and the Heppler's constant have also been computed. The data interpreted in terms of the greater number of opportunities for hydrogen bonding interactions between the unlike molecules for 2,3-pyridyl and piperidine methanols.