

# **Ion-Solvent Interactions Investigated by Isentropic Compressibility Measurements of Tetraalkylammonium, Copper(I) and Sodium Salts in Binary Mixtures of Acetonitrile and *n*-Butyronitrile at 298.15 K**

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Ultrasonic velocities and densities of binary mixtures of acetonitrile (AN) and *n*-butyronitrile (*n*-BTN) with Bu<sub>4</sub>NBPh<sub>4</sub>, Bu<sub>4</sub>NClO<sub>4</sub>, Bu<sub>4</sub>NI, Bu<sub>4</sub>NBr, Pr<sub>4</sub>NBr, Et<sub>4</sub>NI, Et<sub>4</sub>NBPh<sub>4</sub>, NaBPh<sub>4</sub>, NaClO<sub>4</sub> and CuClO<sub>4</sub> have been measured in the concentration range 0.0045–0.2 mol kg<sup>−1</sup> over the entire composition range at 298.15 K. Isentropic compressibilities ( $K_s$ ) and apparent molal isentropic compressibilities ( $K_{s,\phi}$ ) have been calculated. Limiting apparent molal isentropic compressibilities ( $K_{s,\phi}^o$ ) have been evaluated and split into the contribution of individual ions, i. e. into ( $K_{s,\phi}^o$ )<sub>±</sub> values. ( $K_{s,\phi}^o$ )<sub>±</sub> for Cu<sup>+</sup>, Na<sup>+</sup> and Br<sup>−</sup> in all cases is negative and large, for Bu<sub>4</sub>N<sup>+</sup> and Ph<sub>4</sub>B<sup>−</sup> positive and large, and for I<sup>−</sup> and ClO<sub>4</sub><sup>−</sup> negative only in AN, and becomes positive in binary mixtures of AN and *n*-BTN for all compositions. The negative ( $K_{s,\phi}^o$ )<sub>±</sub> values for Cu<sup>+</sup>, Na<sup>+</sup> and Br<sup>−</sup> indicate strong ion-solvent interactions involving electrostatic ion-dipole interactions. The large and positive ( $K_{s,\phi}^o$ )<sub>±</sub> values for Bu<sub>4</sub>N<sup>+</sup> and Ph<sub>4</sub>B<sup>−</sup> show some special type of ion-solvent interactions (hydrophobic or dispersion interactions) with AN and *n*-BTN. The small negative value changing to a small positive value for I<sup>−</sup> and ClO<sub>4</sub><sup>−</sup> indicates the change of a weak electrostatic ion-solvent interaction to another weak special interaction. A comparison of ( $K_{s,\phi}^o$ )<sub>±</sub> for Cu<sup>+</sup> in some solvent systems shows that the ion-solvent interaction behaviour of Cu<sup>+</sup> in AN + *n*-BTN is similar to that in AN + NM, AN + TEP, BN + TEP and PY + TEP mixtures but differs from that observed in AN + DMF and AN + DMSO mixtures.

**Key words:** Ion-Solvent Interaction; Isentropic Compressibility; Copper(I) Salts; Acetonitrile; *n*-Butyronitrile.