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Viscosities and Surface Tension of N, N Methylureas in Aqueous Solutions Measured with Survismeter, a Novel Instrument

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Abstract - Viscosities ($\eta \pm 0.06 \times 10^{-5} \text{ N s m}^{-2}$), surface tension ($\gamma \pm 0.05 \times 10^{-3} \text{ N m}^{-1}$) and densities ($\rho \pm 1 \times 10^{-2} \text{ kg m}^{-3}$) for 0.005 to 0.25 mol kg⁻¹ 1-methylurea (MU), 1, 3-dimethylurea (DMU) and 1, 1, 3, 3-tetramethylurea (TMU) as N, N' methylureas at interval of 0.005 mol kg⁻¹ were measured at pH 7.99 to 7.01 and 293.15, 298.15 and 303.15 K temperatures. Intrinsic viscosities [η] and limiting surface tension γ_0 are obtained from regression with molality, m. Contributions of -CH₃ (methyl) groups are derived from differences in [η] and γ_0 values individually between their subsequent ureas. The [η] and γ_0 values infer weakening of hydrophilic interactions with -CH₃ and strengthening of hydrophobic, and TMU shows structure making effect. As compared to measurements of viscosities and surface tension individually with viscometer and stalagmometer, the Survismeter minimizes 2/3rd of materials, human efforts and infrastructure with better accuracies. It prevents evaporation of liquids during surface tension measurements.

Keywords : Survismeter, surface tension, viscosity, intrinsic viscosities, tetramethylurea, structure breaking/making interactions.

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