

TEMPERATURE DEPENDENCE OF ELECTROLYTIC CONDUCTIVITY FOR SOME ROOM TEMPERATURE IONIC LIQUIDS

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Introduction: Electrolytic conductivities were measured in the temperature range 288.15 K-333.15 K and at atmospheric pressure for three room temperature ionic liquids (RTIL): 1-Ethyl-3-methylimidazolium Bis (trifluorosulfonyl) imide [C2mim][NTf₂], 1-Hexyl-3-methylimidazolium Bis(trifluorosulfonyl)imide [C6mim][NTf₂] and 1-Ethyl-3-Methylimidazolium Ethyl Sulfate [C2mim][EtSO₄] (ECOENG212®). The measurements were performed by means of a novel purpose-made circuitry, connecting a Schott conductivity cell to a lock-in amplifier. The complex impedance of the cell, containing the sample, was measured as a function of the frequency of the alternating current (AC) used and the operating AC voltage was controlled along the frequency sweeps.

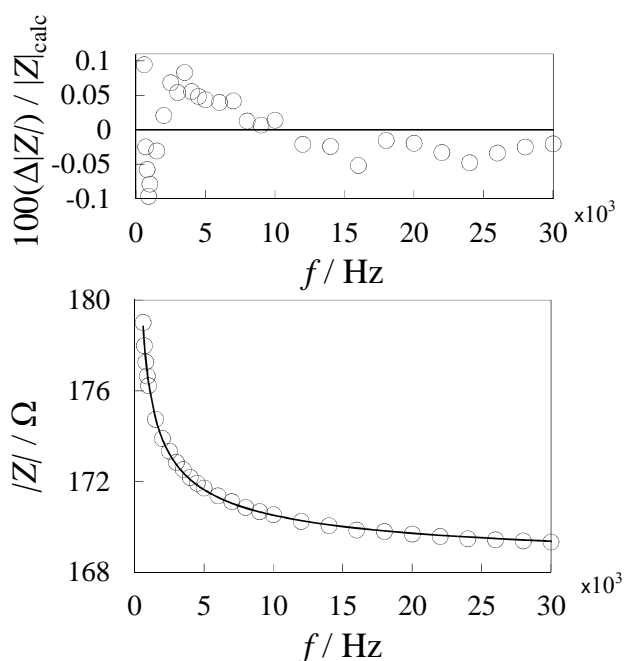


Figure 1. Modulus of complex impedance experimental data and relative deviations as a function of frequency, obtained with a sample of [C2mim][NTf₂] at 298.08K and the corresponding fitting equation (solid line).

The obtained impedance data modulus were fitted using the equation $|Z| = R_{\infty} + \frac{A}{\sqrt{f}}$

where R_{∞} , f and A are the resistance at infinite frequency, frequency and the fitted empirical parameter, respectively.

Conclusions: The measurement method was validated by comparison of the electrolytic conductivity results obtained with reference [C2mim][NTf₂], with some literature measurements performed in a round-robin sample promoted by IUPAC. The preliminary results obtained for all the ionic liquids studied are self-consistent and show a very good agreement with literature data, thus confirming the good working ability of our experimental set-up.

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