Molar Conductivity of Electrolyte Solutions: Its Dependence on Frequency Using Impedance Spectroscopy

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Molar conductivity is an intrinsic characteristic of ions in solution, describing their ability to conduct electric current in relation to their molar concentration. This property is fundamental in the characterization of electrolytes, substances that dissolve in water and generate charged ions, consequently, electrical conductivity. The magnitude of molar conductivity depends on the nature and charges of the ions present in the solution, being widely used in electrochemical studies, chemical and physical-chemical analysis and in understanding the behavior of electrolytes in relation to electrical conduction [1,2].

Molar conductivity can be obtained using a conductivity meter or impedance spectroscopy analysis of the solution, usually focusing on the plateau region of the experimental data. In this region, the electrical impedance remains constant, providing an estimate of the average molar conductivity of the solution, as reported in the literature.

When considering different electrolytic solutions and different concentrations, it is possible to observe, through the impedance spectrum, that the conductivity of the solution varies with frequency. This observation shows that molar conductivity decreases significantly in the low frequency regime and increases in high frequencies. Therefore, by investigating this dependence, it is possible to obtain a more comprehensive and detailed understanding of the electrical behavior of electrolyte solutions. In this case, from strong electrolytes [3,4].

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