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Dielectric spectroscopy of biomolecules at low frequencies: evidence of proton wires

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Abstract

Due to the fact biological processes occur in an aqueous environment, the interactions between biomolecules and water are of fundamental importance. Among these interactions proton transfer is an intriguing and essential process, which is carried out through a coordinated and cooperative motion of water molecules. Here, we use dielectric spectroscopy to measure the relative permittivity and dielectric loss for different amino acid solutions in the region of low frequencies (100 Hz-1 MHz). We found that in the case of L-glutamic acid there is a fast transfer of charge possibly facilitated through proton wires. A similar behaviour is obtained for ovalbumin where L-glutamic acid is an important constituent. Our findings could shed light to improve our understanding of water-biomolecules interactions, which drive the main functions of a cell.

Keywords: Dielectric spectroscopy; Proton wires; Water; Ovalbumin; Biomolecules

1. Introduction

Understanding how biomolecules get stability and functionality under different aqueous environments is one of the most fundamental questions in biology. Water is not only the medium where biomolecules solubilize but the most

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