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Spectroscopic Study of Protein Dynamics in Viscous Solvent KRISTA FREEMAN, Cleveland State University, ALEXANDER AGAPOV, The University of Akron, KIRIL STRELETZKY, Cleveland State University, ALEXEI SOKOLOV, The University of Akron — The dielectric properties of pure glycerol, glycerol-water, and glycerol-water-protein solutions were studied by Dielectric Spectroscopy and Depolarized Dynamic Light Scattering (DDLS) at a wide range of temperatures and frequencies. Analysis of the dielectric spectra revealed three relaxation processes related to protein dynamics (relaxations due to protein rotation, large scale protein motions, and protein-hydration water coupled dynamics) as well as two processes due to the solvent (low frequency relaxation of unknown origin and the main structural relaxation of glycerol). Preliminary investigations with DDLS suggest a direct correlation with the certain relaxations observed in the dielectric spectra. The current study aims to explore the influence of the solvent on the dynamics of the protein, such as preferential hydration of the protein in solution and the coupled or decoupled nature of the protein and solvent dynamics, using both spectroscopic methods mentioned above. In the dielectric studies, all protein solutions tested exhibit strong decoupling of the protein relaxation from the glycerol structural relaxation, especially closer to the glass transition temperature. The dielectric analysis also suggests weak preferential hydration of the protein in solution.

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