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Studies of myoglobin dynamics by dielectric relaxation spectroscopy GUO CHEN, I. MIHUT, B. H. MCMAHON, A. MIGLIORI, P. W. FENIMORE, Los Alamos National Lab — Proteins are dynamic molecules and their motions are intimately linked to the fluctuations of their solvent environment. In this work we studied the protein-solvent interactions by measuring the dielectric response of horse myoglobin (Mb) in glycerol/H_2O mixtures over a frequency range of 40Hz-110MHz. Two relaxation processes were observed at temperatures above 220K. The high frequency process corresponds to the α-fluctuations of the glycerol/H_2O solvent and its rates were found to increase slightly at the presence of the Mb protein. The low frequency process, slower by roughly four orders of magnitude, is relevant to Mb motions and absent for the samples without Mb. The temperature dependence of the two processes can be approximated with the same Vogel-Tammann-Fulcher temperature dependence. Preliminary analyses suggest that the Mb-related process is associated with the conformational fluctuations of the whole Mb protein. Such fluctuations require the coordinated motions of surrounding solvent molecules and are thus an example of protein slaving to the solvent fluctuations.

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