Terahertz Dielectric Response Measurements of the Protein Glass Transition

R. KAO, Physiology and Biophysics Dept., University at Buffalo, SUNY, Buffalo, NY., J. -Y. CHEN, J.R. KNAB, A.G. MARKELZ, Physics Dept., University at Buffalo, SUNY, Buffalo, NY. — Collective vibrational modes associated with protein conformational fluctuations lay in the far infrared or terahertz frequency range (1-200 cm\(^{-1}\)). Numerous dynamical measurements on proteins have found a transition at \( \sim 200 \) K, referred to as a protein glass transition [D. Ringe, G.A. Petsko, Biophys. Chem. 105, 667–680 (2003)]. For temperatures below 200 K the collective mode response is harmonic, whereas above 200 K the collective mode response is anharmonic. We examine how this temperature dependent dynamical transition effects the terahertz dielectric response for both solutions and hydrated films of cytochrome c and bacteriorhodopsin using terahertz time domain spectroscopy. This work was supported by ACS grant PRF 39554-AC6, NSF CAREER grant PHY-0349256 and NSF IGERT grant DGE0114330.