Abstract Submitted
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THz Microscopy of Anisotropy and Correlated Motions in Protein Crystals[1] KATHERINE NIESSEN, GHEORGHE ACBAS, Department of Physics, SUNY at Buffalo, Buffalo, New York, EDWARD SNELL, Hauptman-Woodward Medical Research Institute and SUNY at Buffalo, Buffalo, New York, ANDREA MARKELZ, Department of Physics, SUNY at Buffalo, Buffalo, New York — We introduce a new technique, Crystal Anisotropy Terahertz Microscopy (CATM) which can directly measure correlated intra-molecular protein vibrations. The terahertz (THz) frequency range (5-100 cm^{-1}) corresponds to global correlated protein motions, proposed to be essential to protein function [1, 2]. CATM accesses these motions by removal of the relaxational background of the solvent and residue side chain librational motions. We demonstrate narrowband features in the anisotropic absorbance for hen egg-white lysozyme (HEWL) single crystals as well as HEWL with triacetylglucosamine (HEWL-3NAG) inhibitor single crystals. The most prominent features for the HEWL crystals appear at 45 cm^{-1}, 69 cm^{-1}, and 78 cm^{-1} and the strength of the absorption varies with crystal orientation relative to the THz polarization. Calculations show similar anisotropic features, suggesting specific correlated mode identification is possible. 1. Hammes-Schiffer, S. and S.J. Benkovic, Relating Protein Motion to Catalysis. Annu. Rev. Biochem., 2006. 75: p. 519-41. 2. Henzler-Wildman, K.A., et al., Intrinsic motions along an enzymatic reaction trajectory. Nature, 2007. 450(7171): p. 838-U13.

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