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Terahertz Absorption and Circular Dichroism Spectroscopy of Solvated Biopolymers[1] JING XU, Physics, UCSB, KEVIN PLAXCO, Chemistry and BioChemistry, UCSB, S. JAMES ALLEN, Physics, UCSB — Biopolymers are expected to exhibit broad spectral features in the terahertz frequency range, corresponding to their functionally relevant, global and sub-global collective vibrational modes with $\sim$ picosecond timescale. Recent advances in terahertz technology have stimulated researchers to employ terahertz absorption spectroscopy to directly probe these postulated collective modes. However, these pioneering studies have been limited to dry and, at best, moist samples. Successful isolation of low frequency vibrational activities of solvated biopolymers in their natural water environment has remained elusive, due to the overwhelming attenuation of the terahertz radiation by water. Here we have developed a terahertz absorption and circular dichroism spectrometer suitable for studying biopolymers in biologically relevant water solutions. We have precisely isolated, for the first time, the terahertz absorption of solvated prototypical proteins, Bovine Serum Albumin and Lysozyme, and made important direct comparison to the existing molecular dynamic simulations and normal mode calculations. We have also successfully demonstrated the magnetic circular dichroism in semiconductors, and placed upper bounds on the terahertz circular dichroism signatures of prototypical proteins in water solution.

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Jing Xu
Physics, UCSB

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