CONTINUOUS-WAVE TERAHERTZ SPECTROSCOPY OF BIOMOLECULES

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THz radiation (2-300 cm^{-1}) is ideally suited for studies of the large-amplitude, low-frequency vibrations of biomolecules critical to their folding motions and function. THz spectra of biomolecules have been recorded in solid matrix environments using a high-resolution cw THz spectrometer based on pumping a solid-state photomixer with two near-infrared lasers. THz spectra of biotin and several of the tripeptides (alanine-glycine-alanine), have been obtained at 4.2 K and room temperature. Under cryogenic conditions, all of the spectra display a small number of discrete absorptions having intrinsic linewidths ranging from 0.5 to 3 cm^{-1} In contrast, the room temperature spectra of these samples reveal considerable broadening that may result from either the drastic shifts in vibrational sequence populations and/or structural changes in the matrix cage. Lineshape models based on vibrational anharmonicity are shown to account for most of the temperature dependent features. Molecular modeling is also used to provide some insight into the types of vibrational motions present. Investigations of these systems in solid Ar and H_2 matricies may also be discussed.