VERY FAR INFRARED RESONANT PHENOMENA IN BIOLOGICAL MOLECULES

TATIANA GLOBUS, TATIANA KHROMOVA, BORIS GELMONT, *Department of Electrical and Computer Engineering, The University of Virginia, VA 22904*; DWIGHT WOOLARD, *U.S. Army Research Laboratory, ARO, Research Triangle Park, NC 27709*; MARIA BYKHOVSKAIA, *Department of Biological Sciences, The Lehigh University, Bethlehem, PA 18015*.

Terahertz (THz) Fourier transform spectroscopy of biological materials demonstrate the existence of multiple species-specific low frequency resonance modes associated with weak bonds in molecules. Transmission measurement results are reported for synthetic polynucleotides with different but known base combination and sequences and for more complex DNA double- and single-stranded macromolecules adopting different conformations. Experimental results demonstrate THz signatures that are sensitive to molecule orientation relative to the electric field of radiation. Conventional characterization techniques are used in addition to THz spectroscopy for data analysis. THz spectroscopy shows advantages over IR methods because it yields more species-specific and more sensitive detection of biomolecule structure (including secondary structures) with minimal disturbance from water. Important results of this work include discrimination between single and double stranded molecules, the application of THz spectroscopy for determining biomolecule conformation, and for real time monitoring of structural transitions in macromolecules.