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Title:Far-infrared spectroscopy on free-standing protein films under defined temperature and hydration control
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Abstract:The functionality of proteins is governed by their dynamics. We have performed a systematic investigation on four different proteins in the far-infrared spectral region under control of the two external parameters that have the strongest influence on the dynamics, namely temperature and hydration. The absorption measurements covering the frequency range from 40 cm⁻¹ to 690 cm⁻¹ (1-20 THz) close the gap between the well-studied mid-infrared and the recent THz investigations. By preparing the proteins as free-standing films, we achieve unprecedented reproducibility. Besides a featureless slope in the THz range, we can identify absorption peaks characteristic for each protein and others common to several proteins. We fit the spectra to extract the peak positions and suggest assignments for them. The far-infrared absorption spectra of all proteins are basically independent on hydration. By a detailed analysis of the sorption isotherms this can be explained by the low absorption of biological water, which resembles more the behavior of ice than that of liquid water.
Number of references:50
Inspec controlled terms:biochemistry - infrared spectra - molecular biophysics - proteins - solvation - sorption - spectrochemical analysis - temperature control - thin films - water
Uncontrolled terms:biological water - sorption isotherm - far-infrared absorption spectra - absorption measurement - temperature control - hydration control - free-standing protein films - far-infrared spectroscopy - frequency 1 THz to 20 THz
Inspec classification codes:A8715H Biomolecular dynamics, molecular probes, molecular pattern recognition - A8230N Association, addition, and insertion - A8280D Electromagnetic radiation spectrometry (chemical analysis) - A8265M Sorption and accommodation coefficients (surface chemistry) - A8715D Physical chemistry of biomolecular solutions; condensed states - A8715M Interactions with radiations at the biomolecular level
Numerical data indexing:frequency 1.0E+12 2.0E+13 Hz
Treatment:Experimental (EXP)

Discipline:Physics (A)
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