CONFORMATIONAL DYNAMICS OF LARGE MOLECULES STUDIED BY COHERENT RAYLEIGH-WING, CARS AND FLUORESCENCE SPECTROSCOPY

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Traditional noncoherent spectroscopic techniques, besides their unquestionable importance as experimental tools, possess a cardinal disadvantage due to their irrelevance to phase information, which is contained, in principle, in optical radiation leaving the sample under study. Similarly to the situation in optics before the invention of holography, one may say that in traditional optical spectroscopy there exists, yet unresolved, the phase problem.

Just recently it has been recognized, that coherent variants of optical spectroscopy, such as polarization sensitive Coherent Antistokes (Active) Raman scattering (PCARS), can provide needed phase information, lacking in traditional spectroscopic techniques. In coherent spectroscopy, both amplitude and phase correlation between spectral components of scattered light can be fully recorded, and, as such, a holographic spectroscopy can be realized. Being implemented in our Laboratory it has given significant advantages in the conformational analysis of large organic molecules.

The results are presented of the experimental investigation with PCARS of the β -carotene conformers in solution and the relaxation of the excited states of this molecule; coherent picosecond Rayleigh-wing spectroscopy of the fast conformational changes in β -carotene; the study of integral conformational dynamics by time-resolved fluorescence spectrochronography.