Raman spectroscopy of disulfide bridges and the procession methods of Raman spectra of protein molecules

Abstract

One of the problems in the analysis of Raman spectra is related to the presence of a relatively high fluorescence background. This necessitates the application of special mathematical procedures for the processing of the measured signal. In the first part of this work, we propose an algorithm for the background subtraction in Raman spectra. This method is based on the optimization of one of the existing methods. Detailed analysis of the method is realized. The method of comparing Raman spectra in the absence of the background subtraction is proposed. Both methods were tested using the model and real Raman spectra.

Tha purpose of the second part of the work is to determine the low frequency marker bands of the disulfide bridge. This bond plays an important role in the stabilization of the spatial structure of a protein molecule. To observe and to assign the low-frequency Raman lines of the disulfide bridges, we study three pairs of substances. Each pair can be considered as a monomer-dimer pair. Each of the dimers is formed owing to the disulfide bridge similar to the bridge in protein molecules. The Raman lines that may be assigned to the disulfide bridge are observed in the intervals 135-185 and 215-235 cm^{-1}. The assignment is based on the comparison of the Raman spectra obtained and the published data. The lines observed may serve as the low-frequency markers of the disulfide bridge. The Raman lines in the interval 9-18 cm^{-1} were detected. The low frequency marker bands of the disulfide bridges can be used in the study of the protein structure.