

Recording Raman Spectra Using a Dynamic Fourier Transform Spectrometer

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Abstract: We have developed a dynamic Fourier transform spectrometer for recording Raman spectra in the near-IR range (800–1100 nm). Stability and reliability of operation of the spectrometer is achieved by using corner reflectors in the design as mirrors in the main channel. In order to record a weak Raman signal, we set up a white light channel in the spectrometer which enables locking into the zero optical path difference when summing the interferograms over several scans. A reference channel with sampling frequency $\lambda/4$ lets us improve the sampling accuracy and the signal-to-noise ratio of the emission spectra. Using our spectrometer, we recorded the Raman spectra of test substances with known positions of the emission lines: 1,4-bis(5-phenyl-2-oxazolyl)benzene (POPOP, $C_{24}H_{16}N_2O_2$), stilbene ($C_{14}H_{12}$), acetylsalicylic acid ($C_9H_8O_4$). Comparison of the POPOP Raman spectra obtained on the dynamic Fourier transform spectrometer and a diffraction spectrometer for the same experimental conditions showed that they qualitatively matched, and the time required to record the spectrum on the dynamic Fourier transform spectrometer was 4 times shorter.

Keywords: Raman spectroscopy dynamic Fourier transform spectrometer Fourier transform spectrometer in the visible and near-IR ranges corner reflector white-light channel