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Laboratory implementation of Fourier Transform Infrared (FTIR) spectrograph using a super-continuum laser

Fourier Transform Infrared (FTIR) spectroscopy is a technique to indirectly measure spectrum of electromagnetic wave over a broad range. It is based on low-coherence interferometry. The short coherence of a broadband light is measured in the form of an interferogram and then Fourier transformed to obtain a spectral content of light. FTIR has been used to probe interaction between matters and electromagnetic wave, espetially in the wavelength region, where a dispersive spectrometer is not efficient if not impossible. FTIR is self-calibrated with only one part movement. In addition, FTIR collects all wavelengths simultaneously rather than individually as compared with that of dispersive spectrometer. It is widely used in many fields, such as material science, medical science, and also industrial applications. In this work, a custom design of laboratory prototype of FTIR system using a supercontinuum laser as a light source with the wavelength in range of 1,500 –2,400 nm (6,667 - 4,167 cm^{-1}) will be presented. The system was designed to be a common path of monochromatic and broadband interferometer in a free space Michelson interferometer setup. An interferogram of a monochromatic laser at 532 nm (18,797 cm^{-1}) was used for correction of the phase distortion in the interferogram of the broadband light source. Both broadband and monochromatic lasers share optical components on the same interference system until before entering detectors. They are separated to two separated photodetectors by using a long-pass dichroic mirror. The movable mirror was computer-controlled by the piezoelectric actuator that was placed in the translation manual stage. The result spectrum was analyzed and then compared to the input broadband laser for further performance improvement.

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