IR FTIP System

Summary of the capability of our IR FTIR system for PL, TRPL, and transmission measurements. With a nice feature will be even better. (Zhiyuan Lin)

Zhang's lab is capable of measuring the transmission and photoluminescence (PL) for infrared materials covering a wavelength range from 1 μm to 15 μm based on a Fourier transform infrared spectroscopy (FTIR) system. The transmission measurement is done using the internal light source of the FTIR. As shown in Figure 1, when measuring the transmission, the removable mirror is installed and the internal light source is directed to the sample. For PL measurement, the removable mirror is uninstalled. The PL measurement is done using an 808 nm laser excitation with a maximum peak power of 400 mW. The sample is placed in an external cryostat, which can cool the sample down to 20 K. The PL measurement utilizes a double-modulation technique to get rid of the background noise. This technique modulates the laser and collect the signal using a lock-in amplifier, and recover the spectrum using a PC by doing Fourier transform.

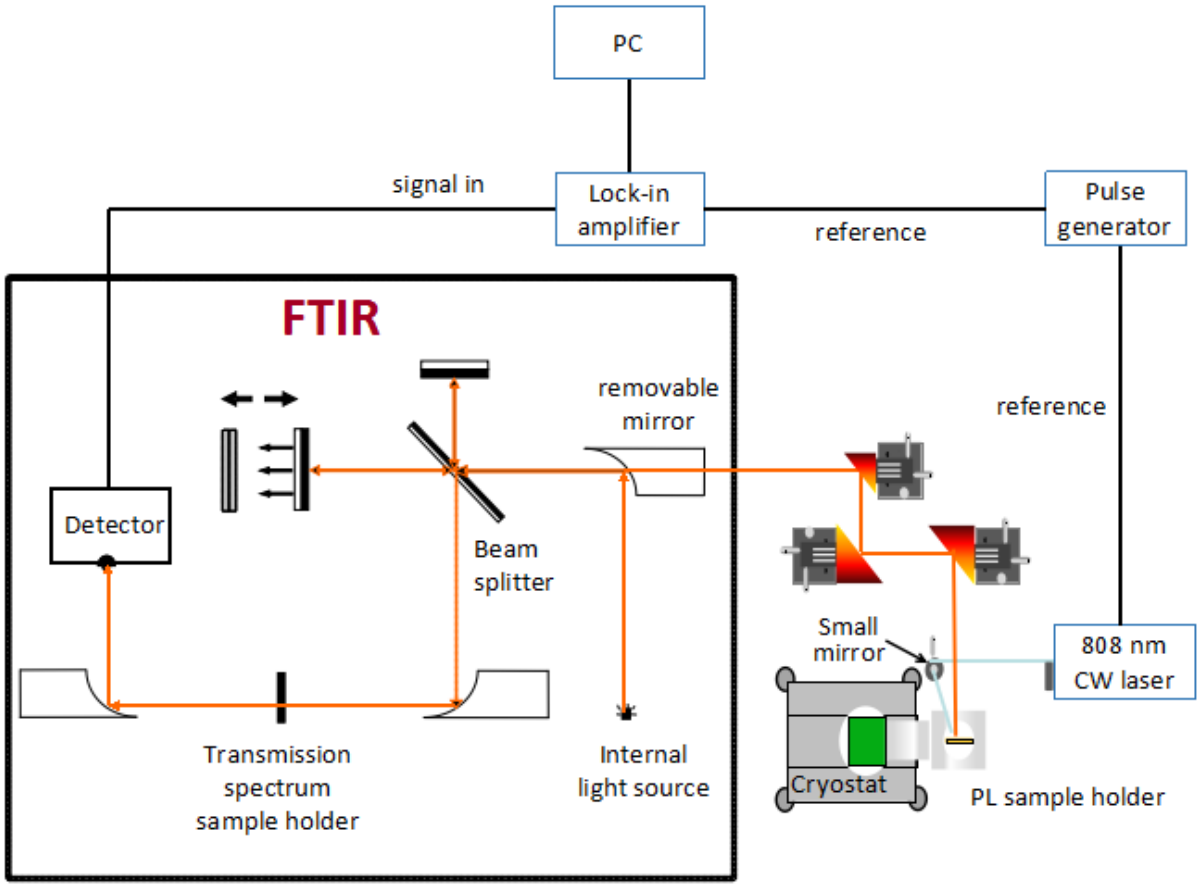

Figure 1. The FTIR for infrared transmission and PL measurement. A double-modulation technique is applied to get rid of the background noise during the PL measurement.

An infrared time-resolved PL (TRPL) setup using real-time baseline correction method is available in Zhang's lab, as shown in Figure 2. The system is capable of a wavelength range from 3 μm to 11 μm, and a frequency range from DC to 50 MHz. The sample is illuminated by a pulse laser with an emission wavelength of 1064 nm, a pulse width of 1 ns, and a maximum pulse energy of 70 μJ. The PL is then collected by a fast MCT detector with a 5mm × 5mm effective area and a maximum frequency of 50 MHz. The boxcar then restores the waveform of the PL decay. Based on the traditional boxcar technique, the real-time baseline correction method adds a chopper and a lock-in amplifier into the system, so that the strong low frequency noise in this setup is significantly suppressed.

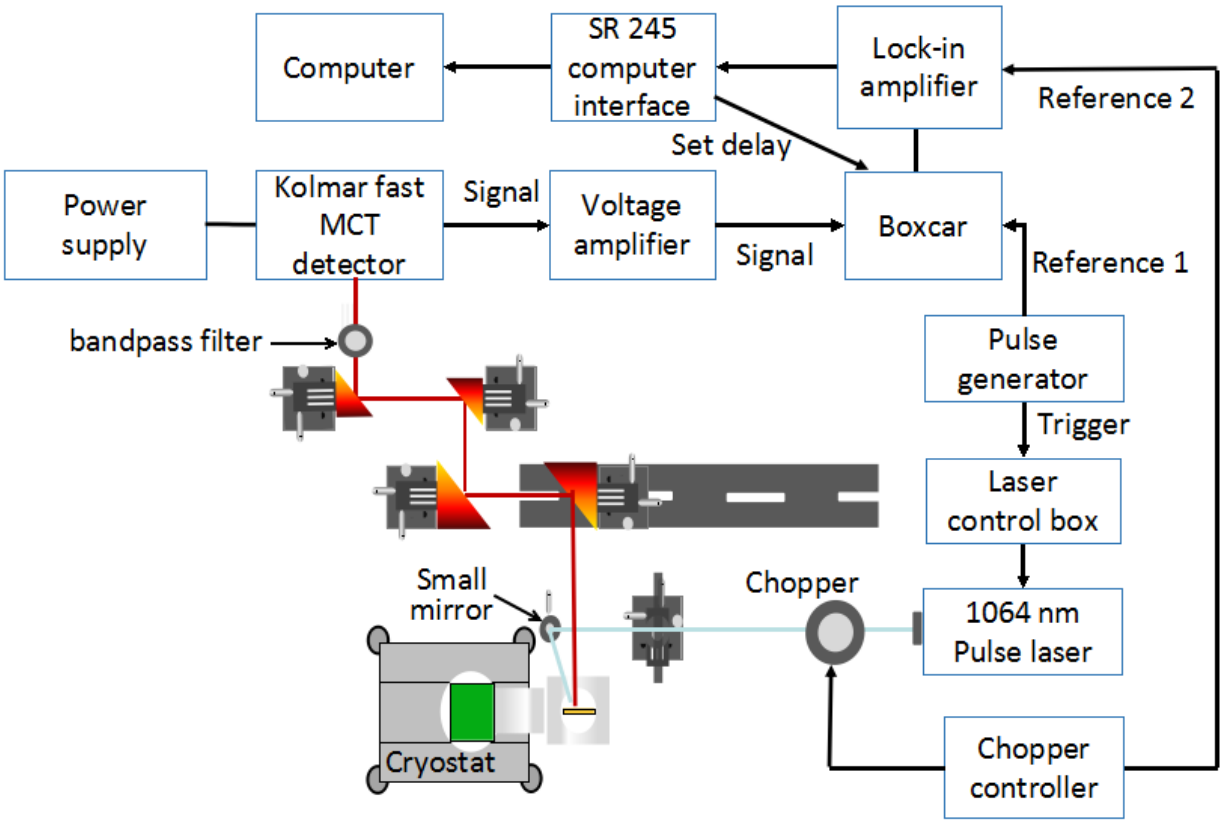

Figure 2. The infrared time-resolved PL setup. A real-time baseline correction method is applied in this setup, and the signal to noise ratio is significantly reduced.