TIME-RESOLVED FOURIER TRANSFORM SPECTROSCOPY WITH A HIGH-RESOLUTION INTERFEROMETER

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A continuously scanning FT spectrometer (Bruker IFS 120 HR) is applied for observing time-resolved spectra after pulse phenomena, where we newly developed a multi-sampling method with a help of a chip computer SX[a]. He-Ne laser fringe signals and a scan signal from the spectrometer are fed into the chip computer SX28AC (Scenix Semiconductors Inc.) which operates with a 50 MHz clock and generates various kinds of pulses, that is, discharge trigger, AD trigger, and data acquisition control signals by programming. We use a 16 bit AD converter (ADC 4322, Analogic) with a speed of 2 MHz. The time resolution is 1 μsec which is limited by the detector amplifier. In a pulse discharge with a duration of 20 μsec, maximum 64 data were collected to produce 64 interferograms with 1 μsec interval, where we set a scanner velocity corresponding to 10 kHz for the He-Ne laser fringe signal. We applied this system to a pulse discharge in a mixture of rare gases and hydrogen, to observe infrared emission spectra of rare gas hydrides and ionic species. In the case of a He discharge, many new infrared bands originated from Rydberg states were observed and spectroscopic analysis was carried out. Most of Rydberg states were produced efficiently in afterglow plasma. The time profiles of infrared emission spectra of several species were analyzed to estimate rate constants.

[a] K. Kawaguchi, O. Baskakov, Y. Hosaki, Y. Hama, and C. Kugimiya, *Chem. Phys. Lett.* **369**, 293(2003)