INFRARED EMISSION SPECTRUM OF He_2 OBSERVED BY A PULSED DISCHARGE

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The He_2 molecule is known to have many electronic transitions between Rydberg states in visible and ultraviolet regions. However, in infrared region only two bands $b^3\Pi_g$ - $a^3\Sigma_u^+$ and $B^1\Pi_g$ - $A^1\Sigma_u^+$ have been studied by using a DC discharge method so far. Recently we developed a time resolved Fourier transform spectroscopy with high resolution Bruker IFS 120 HR by using micro controller SX[a]. In the present study, the FT system was applied to infrared emission spectroscopy of He_2 which was produced by a pulsed discharge in He with pulse width of 20 μsec and 1 A peak-to-peak current. In the 1800-10000 cm^{-1} region, many electronic transitions have been observed in addition to the previously reported two bands. From observed time profiles of emission spectra, Rydberg states with higher energy than the b state are produced efficiently in afterglow plasma after termination of the discharge.

A least-squares analysis was carried out for the $h^3\Sigma_u^+$ - $g^3\Sigma_g^+$ and $g^3\Sigma_g^+$ - $d^3\Sigma_u^+$ bands in the 3200 cm^{-1} region to determine the molecular constants. A transition from an un-identified state to the $d^3\Sigma_u^+$ state has been observed with irregular P- and R- branch intensities.

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