ELECTRONIC SPECTROSCOPY OF THE $GeCl_2$ $\tilde{A}$–$\tilde{X}$ TRANSITION

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Laser-induced fluorescence (LIF) excitation spectrum of the $GeCl_2$ $\tilde{A}^1B_1$–$\tilde{X}^1A_1$ transition at ultraviolet (UV) wavelengths (307-322 nm) was recorded in a direct-current (dc) discharge supersonic free jet expansion. The LIF excitation spectrum is similar to the spectrum reported by Karolczak et al.[a] in a pyrolysis jet expansion. In the UV excitation spectrum of $GeCl_2$, several sharp bands at longer wavelengths and a congested broad band at shorter wavelenghs were observed. Recently, a theoretical study[b] suggested some revisions on the vibrational assignments of the observed sharp bands, and proposed a different interpretation of the congested broad band feature. We have successfully acquired the dispersed fluorescence spectra following the excitation of these $GeCl_2$ UV bands for the first time. Analysis of these dispersed fluorescence spectra reveals the detailed vibrational structure of the $GeCl_2$ ground electronic state ($\tilde{X}^1A_1$) as well as the distinctive difference between the emission spectra of pumping the sharp bands and those of pumping the congested broad band. In addition, the fluorescence radiative lifetimes of the observed upper levels were also measured and analyzed. Our results will help to clarify the controversial assignments of the $GeCl_2$ UV band system.

[a] J. Karolczak, Q. Zhuo, D. J. Clouthier, W. M. Davis, and J. D. Goddard, *J. Chem. Phys.* 98, 60-70 (1993).
[b] D. K. W. Mok, F.-T. Chau, E. P. F. Lee, and J. M. Dyke, *ChemPhysChem* 6, 719-731 (2005).