LASER INDUCED FLUORESCENCE SPECTROSCOPY OF THE SiNSi $^2\Delta - \tilde{X}\ ^2\Pi$ TRANSITION

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On our SiCN/SiNC experiment[a], we measured laser induced fluorescence excitation spectrum in the range, 27,500 $\sim$ 33,000 cm^{-1}, under jet cooled condition. Some of the vibronic bands in the spectrum have been assigned to Si containing species, such as Si_2, $SiCH_2$, SiCN, and SiNC, but some remain unassigned. The strongest band among them has a $^2\Pi - {}^2\Pi$ type rotational structure. The rotational constants of the ground and excited states are determined to be about 0.11 cm^{-1}, and they are about half of those of SiCN and SiNC. The spin-orbit interaction constant is determined to be 141.7 and 2.7 cm^{-1} for the ground and excited states, respectively. Those are comparable with 140.8 and 4.9 cm^{-1} for the $\tilde{X}\ ^2\Pi$ and $\tilde{A}\ ^2\Delta$ states of SiCN (not SiNC), respectively. As a result of some discussion, we have finally conclude that the spectrum can be attributed to the $^2\Delta - \tilde{X}\ ^2\Pi$ transition of Si–N–Si. The $^2\Sigma^+ - \tilde{X}\ ^2\Pi$ transition of Si_2N was studied by two groups[bc]. The rotational constant of the ground $\tilde{X}\ ^2\Pi$ state agrees with that of the previous work. The vibronic structure of the laser induced fluorescence excitation spectrum is unusual; the $^2\Sigma - {}^2\Pi$ type vibronic bands have been only identified.

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