OPTICAL EMISSION STUDIES OF NEW BAND SYSTEM OF SILICON DIMER

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Silicon containing molecules such as SiC, SiN and Si_2 are of astrophysical interest and their studies provide information about the construction and evolution of different interstellar bodies. The emission spectrum of silicon dimer is recorded in the region of 360-540 nm using laser ablation technique. A rotating silicon rod of high purity, placed in the ablation chamber under argon atmosphere of 0.1 torr pressure, is irradiated with focused output of 355 nm from pulsed Nd:YAG laser. The plasma thus produced by laser ablation is allowed to cool for 300 ns and emission from the cooled plasma is collected on the entrance slit of Spex TRIAX 320M monochomator with ICCD detector system. About 96 bands including 22 bands reported by previous workers are observed. All these bands are assigned into two new band systems H'-$D^3\Pi_u$, I-$X^3\Sigma_u^-$, and three already reported $H^3\Sigma_u^-$ - $X^3\Sigma_g^-$, $K^3\Pi_u^- - X^3\Sigma_g^-$ and $L^3\Pi_g$-$D^3\Pi_u$ band systems of silicon dimer. Out of these 96 bands, 43 bands are assigned to two new band system H'-D and I-X while 33 bands including 17 bands reported by earlier workers in this region are assigned to H-X system of Si_2 molecule. In addition to these bands, two bands are assigned to K-X system while the three bands reported by [a] $Douglas$ and [b] $Dubious$ and Leclercq are marked to L-D system. The detailed analyses of these systems are investigated in present work. The (0,0) band of H-X system is observed for the first time during this investigation. The molecular constants along with dissociation energies and internuclear distances are calculated from the observed spectra.

[a] $A.E.Douglas, Can.J.Phys.33(1955)801 - 810$
[b] $I.Dubois, H.Leclercq, Can.J.Phys49(1971)3053 - 3054$