The Optical and Optical/Stark Spectrum of Iridium Monocarbide and Mononitride

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Supersonic molecular beam samples of iridium monocarbide, IrC, and iridium mononitride, IrN, were generated using a laser ablation/reaction source and characterized using high resolution ($\Delta\nu < 30$ MHz FWHM) laser induced fluorescence spectroscopy. This is the first identification of gaseous IrN. The conventional high temperature spectra of IrC was recorded some time ago[a,b]. Numerous strong band systems in the 18800 cm^{-1} to 14360 cm^{-1} spectral range were assigned as the (v',0) progression of the $\tilde{A}^1\Pi$ - $\tilde{X}^1\Sigma^+$ band system of IrN. The (1,0) and (0,0) bands were analyzed to produce a set of fine and hyperfine parameters. The electric field induced effects on the $R(0)$ branch features of these bands were analyzed to produce permanent electric dipole moments: $\tilde{A}^1\Pi(v{=}0)$ 2.78(2) D, $\tilde{A}^1\Pi(v{=}1)$ 2.64(2) D and $\tilde{X}^1\Sigma^+(v{=}0)$ 1.66(1) D. The (0,0) $\tilde{D}^2\Phi_{7/2}$-$\tilde{X}^2\Delta_{5/2}$ band system of IrC was recorded and analyzed to produce a set of fine and hyperfine parameters. The electric field induced effects on the $R(2.5)$ branch feature were analyzed to produce permanent electric dipole moments: $\tilde{D}^2\Phi_{7/2}$ ($v{=}0$) 2.61(6) D and $\tilde{X}^2\Delta_{5/2}$ ($v{=}0$) 1.60(7) D. Plausible electronic configurations consistent with the experimental observations are given.

[a]K. Jansson, R. Scullman and B. Yttermo, Chem. Phys. Lett. **4**, 188 (1969).
[b]K. Jansson and R. Scullman, J. Mol. Spectrosc. **36**, 248 (1970).

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