FOURIER TRANSFORM EMISSION SPECTROSCOPY OF NEW ELECTRONIC TRANSITIONS OF RuN AND VN

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Emission spectra of RuN and VN have been investigated at high resolution using a Fourier transform spectrometer. The RuN molecules were generated in a ruthenium hollow cathode lamp by exciting a mixture of about 2.5 Torr of Ne and 5 mTorr of N_2. New bands with origins near 17758.1, 18866.4, 19800.4 and 20721.5 cm^{-1} have been assigned as the 0-1, 0-0, 1-0 and 2-0 bands of a new $^2\Sigma^+$- $^2\Sigma^+$system with the lower state as the ground state. This transition has been labeled as the $F\,^2\Sigma^+$- $X^2\Sigma^+$ where the $F\,^2\Sigma^+$ state arises from the $1\sigma^2 2\sigma^2 1\pi^4 1\delta^4 4\sigma^1$ configuration. A rotational analysis of these bands provides the principal equilibrium constants for the ground state of RuN as, $\Delta G(\frac{1}{2})''$= 1108.3235(22) cm^{-1}, B_e''=0.5545023(42) cm^{-1}, α_e''=0.0034468(57) cm^{-1}, r_e''=1.5714269(60) Å. The excited $F\,^2\Sigma^+$ state has equilibrium constants of ω_e'=946.8471(40) cm^{-1}, $\omega_e x_e'$=6.4229(14) cm^{-1}, B_e'=0.50085(21) cm^{-1}, α_e'=0.00375(10) cm^{-1}, r_e'=1.65345(34) Å. This transition is analogous to the $E^2\Sigma^+$- $X^2\Sigma^+$system of RhC [Balfour et al., J. Mol. Spectrosc. **198**, 393 (1999)].

The VN molecules were formed from the reaction of $VOCl_3$ vapor with active nitrogen and were excited in a microwave source. A new band observed near 17433 cm^{-1} has been assigned as the 0-0 band of the $f^1\Phi$-$a^1\Delta$ transition of VN with the lower $a^1\Delta$ state common to the lower state of the $e^1\Pi$-$a^1\Delta$ transition observed previously [Ram, Bernath and Davis, J. Mol. Spectrosc. **210**, 110 (2001)].