ELECTRONIC SPECTROSCOPY OF JET-COOLED RHODIUM MONONITRIDE AND RHODIUM MONOCARBIDE IN THE VISIBLE REGION

S. FOUGERE, W. J. BALFOUR, R. F. HEUFF, and C. X. W. QIAN, *Department of Chemistry, University of Victoria, Victoria, B.C. Canada V8W 3P6.*

We report the gas phase spectroscopic studies of the rhodium mononitride (RhN) and rhodium monocarbide (RhC) radicals. RhN/RhC molecules were produced in a laser vaporization apparatus utilizing rhodium metal and ammonia/methane. Laser induced fluorescence spectra were recorded in the 390-750 nm region. It is believed that this is the first observation of the RhN radical in the laboratory. Transitions with $\Lambda = 0$ and 1 have been noted. Rotational and vibrational analyses have been performed and assignments made based on these and on $^{14}N/^{15}N$ isotopic shifts, excited state lifetimes and dispersed fluorescence (DF) spectra. The $Rh^{14}N$ DF spectra reveal the presence of several low-lying electronic states and long progressions have provided information on the vibrational spacing. A $...\delta^4\sigma^2$ electronic configuration is proposed for the ground state of RhN which agrees with the observation that all the jet-cooled spectra have $^1\Sigma$ as their lower state. Possible electronic configurations for other low-lying electronic states as well as excited states will be discussed. The RhC bands observed by Lagerqvist and Scullman[a] have been re-examined. Many bands not reported by them have also been observed. The new results suggest that the B-X spectra need to be reinterpreted. The DF spectra from both B and C states show long ground state progressions(v=0 to v=10). Emission to the $A^2\Pi$ state has also been observed.

[a] A. Lagerqvist and R. Scullman, Ark. Fys., 32, 479 (1965).