

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

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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 $^{14}\text{N}/^{15}\text{N}$ 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.

^aA. Lagerqvist and R. Scullman, *Ark. Fys.*, 32, 479 (1965).