

HIGH RESOLUTION LASER SPECTROSCOPY OF RHENIUM CARBIDE

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The first spectroscopic study of rhenium carbide, ReC, has been performed using both low and high resolution techniques to collect rotationally resolved electronic spectra from 420 to 500nm. Laser-induced fluorescence (LIF), and dispersed fluorescence (DF) techniques were employed. ReC was formed in our laser ablation molecular jet apparatus by ablating a rhenium target rod in the presence of 1% methane in helium. The low resolution spectrum identified four bands of an electronic system belonging to ReC, three of which have been studied so far. Extensive hyperfine structure composed of six hyperfine components was observed in the high resolution spectrum, as well as a clear distinction between the ^{187}ReC and ^{185}ReC isotopologues. The data seems consistent with a $^4\Pi - ^4\Sigma^-$ transition, as was predicted before experimentation^a. Dispersed fluorescence spectra allowed us to determine the ground state vibrational frequency ($\omega_e''=994.4 \pm 0.3 \text{ cm}^{-1}$), and to identify a low-lying electronically excited state at $T_e''=1118.4 \pm 0.4 \text{ cm}^{-1}$ with a vibrational frequency of $\omega_e''=984 \pm 2 \text{ cm}^{-1}$.

^aPersonal communication, F. Grein, University of New Brunswick