THE ELECTRONIC SPECTRUM OF TaCH IN THE VISIBLE REGION

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Fluorescence excitation spectra of gaseous TaCH and TaCD have been recorded following reaction of laser-ablated tantalum with CH_4 or CD_4 under jet-cooled molecular beam conditions. A total of 27 bands of TaCH and 18 of TaCD were observed in the visible region. High resolution spectra reveal the $\tilde{X}0^+$ ground state to have the substitution structure r_0(Ta-C)=1.7714 Åand r_0(C-H)=1.080 Å. Since the $\tilde{X}0^+$ state has no orbital or spin angular momentum, we observe only quadrupole splitting due to the ^{181}Ta nucleus (I=7/2). Resolved fluorescence studies have given the TaCH ground state vibrational frequencies ν_2(bend)=640 cm^{-1} and ν_3(Ta-C stretch)=960 cm^{-1}. Analysis is currently underway on an $\Omega = 0^+$ state at 16391.9 cm^{-1} and an $\Omega = 1$ state at 16376.0 cm^{-1}. Through mixing with the $\Omega = 1$ state, the upper $\Omega = 0^+$ state has acquired some magnetic hyperfine character.