

## 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<sub>4</sub> or CD<sub>4</sub> 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  $r_0(\text{Ta-C})=1.7714 \text{ \AA}$  and  $r_0(\text{C-H})=1.080 \text{ \AA}$ . Since the  $\tilde{X}0^+$  state has no orbital or spin angular momentum, we observe only quadrupole splitting due to the <sup>181</sup>Ta nucleus ( $I=7/2$ ). Resolved fluorescence studies have given the TaCH ground state vibrational frequencies  $\nu_2(\text{bend})=640 \text{ cm}^{-1}$  and  $\nu_3(\text{Ta-C stretch})=960 \text{ cm}^{-1}$ . Analysis is currently underway on an  $\Omega = 0^+$  state at  $16391.9 \text{ cm}^{-1}$  and an  $\Omega = 1$  state at  $16376.0 \text{ cm}^{-1}$ . Through mixing with the  $\Omega = 1$  state, the upper  $\Omega = 0^+$  state has acquired some magnetic hyperfine character.