PUMP/PROBE MICROWAVE-OPTICAL DOUBLE RESONANCE (PPMODR) STUDY OF TUNGSTEN CARBIDE (WC) AND PLATINUM CARBIDE (PtC)

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Gas-phase metal-containing molecules serve as ideal venues for testing computational methodologies being developed to predict chemical properties of simple molecules. The most accurate determination of molecular properties comes from the analysis of pure rotational spectra, which for metal containing molecules can be difficult to obtain. One powerful method for recording pure rotational spectrum is to use the PPMODR technique [a] which couples the sensitivity of optical detection with the precision of molecular beam microwave spectroscopy. Here we report on the application of PPMODR to the study of tungsten carbide, WC [b], and platinum carbide, PtC. The $J = 1 \rightarrow 2$ pure rotational transitions in the $X^3\Delta_1(v = 0)$ state of ^{186}W^{12}C and ^{184}W^{12}C reveal a small splitting, an analysis of which provides accurate determination of the rotational and Ω-doubling parameters for the $X^3\Delta_1(v = 0)$ state, which are critical to the proposed electron electric dipole moment experiments (eEDM) [c,d,e]. The implications for the proposed eEDM measurements will be presented. We also report on the $J = 0 \rightarrow 1$ and $J = 1 \rightarrow 2$ rotational transitions of PtC for the $X^1\Sigma^+(v = 0)$ state. The ^{195}Pt(I=1/2) nuclear spin-rotation interaction parameter, C_I^{eff} , was determined to be 0.138(6) MHz. A comparison with other Pt-containing molecules and a proposed molecular orbital correlation diagram is given.

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