OPTICAL-OPTICAL DOUBLE RESONANCE AND LIF SPECTROSCOPY OF THE JET-COOLED BORON CARBIDE (BC) FREE RADICAL

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The boron carbide (^{11}BC and ^{10}BC) free radical has been produced in a pulsed discharge jet using a precursor mixture of 1% trimethylborane [$B(CH_3)_3$] in high pressure argon. The 560 nm $B^4\Sigma^-$ - $X^4\Sigma^-$ electronic transition of both isotopologues has been studied in detail by LIF and emission spectroscopy. The 290 nm $E^4\Pi$ - $X^4\Sigma^-$ band system was also studied using high-resolution LIF techniques, although the rotational structure of the bands was found to be quite complicated due to significant spin-spin and spin-orbit splittings in the excited state. In order to fully assign the spectra, an optical-optical double resonance (OODR) scheme was implemented in which a yellow-green dye laser beam populated a specific rotational level of the *B* state and a second tunable red dye laser beam was used to promote the $E^4\Pi$ - $B^4\Sigma^-$ transition. The OODR transitions were detected by monitoring the resulting $E^4\Pi$ - $X^4\Sigma^-$ UV fluorescence. The OODR spectra consist of readily assignable spin-split P-, Q-, and R-branch lines from a single intermediate state N value, which greatly facilitated the assignment of the *E* - *X* LIF spectra. Progress in analyzing the spectra will be discussed.