LABORATORY DETECTION AND PURE ROTATIONAL SPECTRUM OF THE CaC RADICAL ($X^3\Sigma^-$)

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The pure rotational spectrum of CaC ($X^3\Sigma^-$) has been measured with millimeter-wave direct absorption techniques in the frequency range 248 to 536 GHz. This work is the first laboratory observation of the CaC radical in the gas-phase. Calcium carbide was formed by the reaction of Ca vapor, produced in a Broida-type oven, and CH_4. Extreme DC discharge conditions were required to produce this radical. Eleven transitions of CaC have been recorded in which fine structure, due to the two unpaired electrons, was resolved. An almost equally spaced triplet was observed for all transitions. Calcium carbide was analyzed with a case b basis set, as is appropriate for this radical, and the rotational, spin-rotation, and spin-spin constants were determined to a high degree of accuracy. This study is the first time that an alkaline-earth monocarbide has been observed in the laboratory by any spectroscopic technique.