# Determination of temperatures using CH radical emission spectroscopy

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**Abstract:** An improved Boltzmann plot method where the intensity is taken as the integral of the experimental spectrum within a special band for a cluster of rotational line of $R$ and $Q$ branches is proposed in the current study. This method aims to deduce rotational and vibrational temperatures using CH radical $A^2\Delta$-$X^2\Pi$ band emission spectroscopy accurately. In addition, the data relative to the rotation lines of $CH(A^2\Delta$-$X^2\Pi)$ for both temperatures are assembled. The emission spectrum of $CH(A^2\Delta$-$X^2\Pi)$ at the inner cone of an acetylene-oxygen flame in a rich oxygen state is recorded and both the temperatures are determined by the method above. The avlues were recorded as 3141 K and 3097 K, for the rotational and vibrational temperatures, respectively. This result reveals that the equilibrium between the rotation and vibration states is achieved. A simple discussion for this method is also provided.

**Keywords:** temperature measurement; CH radical; emission spectrum; Boltzmann plot method

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