

## ON THE OUTCOME OF THE REACTIONS BETWEEN HYDROCARBON RADICALS AND O<sub>2</sub> IN HELIUM NANODROPLETS

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Helium nanodroplet isolation and infrared laser spectroscopy are used to investigate the CH<sub>3</sub> + O<sub>2</sub> and C<sub>3</sub>H<sub>3</sub> (propargyl) + O<sub>2</sub> reactions. The hydrocarbon radicals are generated in an effusive pyrolysis source located upstream from a differentially pumped O<sub>2</sub> gas pick-up cell. In this experimental configuration, the reaction occurs between sequentially picked-up and presumably cold fragments. The CH<sub>3</sub> + O<sub>2</sub> reaction leads barrierlessly to the methyl-peroxy radical, and despite having to dissipate an energy of approximately 30 kcal/mol, the infrared spectra reveal a large abundance of droplets containing the cold CH<sub>3</sub>O<sub>2</sub> radical. Theoretical studies have predicted an approximately 2-4 kcal/mol barrier in the entrance channel of the C<sub>3</sub>H<sub>3</sub> + O<sub>2</sub> reaction. Therefore, we initially expected to see a weakly bound entrance channel C<sub>3</sub>H<sub>3</sub>-O<sub>2</sub> van-der-Waals complex, given the rapid cooling provided by the dissipative helium environment. However, only the trans-acetylenic isomer of the propargyl-peroxy radical is observed. The dipole moment of this species is measured with infrared laser Stark spectroscopy.