OBSERVATION OF METASTABLE AUTODETACHING STATES OF METHIDE, CH$_3^-$ $^a$

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Metastable autodetaching states of methide, CH$_3^-$, have been observed, with an autodetachment lifetime of tens to hundreds of $\mu$s. The excited state responsible for autodetachment is unknown, but could be a vibrationally excited state, because one vibrational quantum of the $\nu_1$, $\nu_2$, or $\nu_3$ vibrational mode has enough internal energy to produce autodetachment of the low-electron-affinity (0.08 eV) ion. The long lifetime may arise from small Frank-Condon overlap between the initial pyramidal ion and the final planar neutral. There are presently no theoretical calculations of the autodetachment mechanism or lifetimes.

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