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TI Anion production in high-velocity cluster-atom collisions; the electron capture process revisited

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ID HYDROGEN-ATOMS; CROSS-SECTIONS; FRAGMENTATION; EMISSION; GASES; IONS; HE

AB Anion production cross sections in collisions between C-n(+), C<sub>n</sub> carbon clusters (n ≤ 5) and helium atoms have been measured in high-velocity collisions (v = 2.25 and 2.6 au). This paper focuses on two of the three processes responsible for the C-n(-) production, namely double electron capture (DEC) onto C-n(+) cations and single electron capture onto neutral (SECN) C-n. They were experimentally distinguished from a gaseous thickness dependence study. Dissociative and non-dissociative cross sections were measured and, in the case of DEC, all dissociative branching ratios measured; for these small systems, the C-2(-) fragment was found magical. Data concerning electron capture in neutral-neutral collisions are extremely rare, especially at high velocity. Introduction of this measured process in the independent atom and electron (IAE) model allowed us to revisit and satisfactorily reproduce the so-far unexplained size evolution of single electron capture (SEC) cross sections in 2.6 au C-n(+)-He (n ≤ 10) collisions (Chabot et al 2006 J. Phys. B: At. Mol. Opt. Phys. 39 2593-603). IAE calculations for DEC cross sections and their comparison with experiment suggest a loss of electron in anionic C-n(-) species after the collision, competing with fragmentation and depending on the size.

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