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TI Ion-pair dissociation of highly excited carbon clusters: Size and charge effects

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AB We present measurements of ion-pair dissociation (IPD) of highly excited neutral and ionized carbon clusters $C_{n=2-5}(q=0-3)^+$. The tool for producing these species was a high-velocity collision between $C_{n(+)}$ projectiles ($v = 2.25$ a. u.) and helium atoms. The setup allowed us to detect in coincidence anionic and cationic fragments, event by event, leading to a direct and unambiguous identification of the IPD process. Compared with dissociation without anion emission, we found typical 10^{-4} IPD rates, not depending much on the size and charge of the (n, q) species. Exceptions were observed for $C_{2(+)}$ and, to a lesser extent, $C_{4(3+)}$ whose IPDs were notably lower. We tentatively interpret IPDs of $C_{2(+)}$ and $C_{3(+)}$ by using a statistical approach based on the counting of final states allowed by energetic criteria. The model is able to furnish the right order of magnitude for the experimental IPD rates and to provide a qualitative explanation of the lower IPD rate observed in $C_{2(+)}$.

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