PHOTODISSOCIATION AND VELOCITY-MAP IMAGING OF CARBON CLUSTER CATIONS

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Carbon cluster cations are generated in the gas phase by laser vaporization of a carbon rod in a pulsed supersonic expansion. $C_n{}^+$ clusters (n = 6,7,10,11,12,15,20) are mass selected using a reflectron time-of-flight mass spectrometer and photodissociated at 355 nm. The main channel for this multiphoton dissociation process is the loss of neutral C_3, resulting in $C_{n-3}{}^+$ cation fragments. The cationic fragments are reaccelerated into an imaging flight tube with velocity-map imaging grids and detected with an imaging detector. Significant kinetic energy release (KER) is observed for all of these cations, but with much greater KER values detected for the larger species. Specifically, the n = 10,11,12,15 and 20 species known to have monocyclic ring structures produce much greater KER than the n = 6 and 7 species known to have linear structures. Consideration of photon energies for two- or three-photon processes, together with the KER values and estimates for ring strain energies allows investigation of the energetics of the bonding and dissociation in these systems.