VIBRATIONALLY MEDIATED ELECTRON CAPTURE IN THE $CO_2(H_2O)_6$ ANION

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We report the vibrational predissociation spectrum of the $CO_2(H_2O)_6$ anion and show how we can force an electron capture event by exciting transitions in the Mid-IR. We demonstrate that the argon-tagged species ($CO_2(H_2O)_6$ -Ar) is almost completely composed of a reactive isomer, where the CO_2 molecule is attached on the backside of the anionic water hexamer network. Detailed investigation of the vibrational predissociation spectrum of this species reveal two different loss channels, each dominant in different regions of the IR. The loss of 2 water molecules and 1 argon atom is the main loss channel in the higher energy range and shows transitions associated with OH-stretching of water hexamer anion. The loss of 1 water and 1 argon, on the other hand, dominates our lower energy range in the Mid-IR, not only confirming the anionic nature of the water hexamer, but also revealing neutral character to the CO_2. By exciting transitions throughout the Mid-IR, we are able to trigger electron capture from the water hexamer anion onto the CO_2 molecule. This releases the reaction exothermicity via the loss of water and argon, and pushing the reaction forward from the reactive entrance channel complex to the valence ion form, where the CO_2 anion is solvated by the remaining water molecules.