PHOTOELECTRON IMAGING OF VIBRATIONALLY MEDIATED PHOTODETACHMENT IN THE VINYLIDENE ANION

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We present resonant, vibrationally mediated two-photon photodetachment of the vinylidene anion through the symmetric and asymmetric CH stretches. This is an excellent example of one method to record vibrational spectra of mass-selected anions. The velocity map imaging technique employed here also allowed us to measure both the angular and energy distributions of the ejected electrons. An intriguing result is that the angular distribution is vastly different for excitation through the two C-H stretching modes. Photodetachment of the electron primarily populates the ground state of the metastable neutral vinylidene isomer and also shows a significant excitation of the CH_2 scissors mode. Furthermore, the photoelectron yield increases linearly over a very wide range of laser fluence for the two-photon process, suggesting a very large difference in the cross sections of the two absorption steps.