ULTRAFAST HYDROGEN TRANSFER IN N,N-DIMETHYLISOPROPYL AMINE CLUSTERS

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In molecular beams, the tertiary amine N,N-dimethylisopropyl amine (DMIPA) can form clusters that are evident in photoelectron and mass spectra obtained upon resonant multiphoton ionization via the 3p or 3s Rydberg states. By delaying the excitation pulse from the ionization pulse we can time resolve the ultrafast dynamics of the 3p to 3s internal conversion. The mass peaks of the parents and fragments mirror this relaxation. In addition, we observe an unusual time dependence of a protonated parent species, which we interpret as the signature of an ultrafast proton or hydrogen transfer from one parent molecule to the N-atom of its partner in the dimer cluster. The cluster ion fragments after the reaction. DFT calculations of the cluster structure support a proton or H-transfer between tightly bonded cluster components.