DETERMINATION OF THE DISSOCIATION ENERGY OF AMMONIA DIMER: A VIBRATIONAL PREDISSOCIATION STUDY

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We have investigated the dynamics of ammonia dimer following initial vibrational excitation in the NH-stretch region using a combination of resonance enhanced multiphoton ionization (REMPI) and velocity-map ion imaging. Upon excitation of either the symmetric (3331 cm^{-1}), or the antisymmetric (3427 cm^{-1}) intramolecular NH-stretch vibration, the dimer predissociates into its two constituent monomers. Based on our assignments of the bands in the REMPI-action spectrum, we were able to selectively ionize specific rovibrational states of one of the monomer fragments via (2+1) REMPI, and subsequently image the resulting translational energy distribution. Since both energy and momentum are conserved in the dissociation process, the rovibrational state of the partner fragment is readily deduced. Fitting our energy distributions with a simple model that accounts for all energetically accessible rotational states, we find that the ν_2 umbrella mode, which is populated up to $v = 3$, is preferentially formed with rotational levels having high J values. By fitting a series of distributions obtained from probing different rovibrational states in the $v_2 = 2$ manifold, we obtain a dissociation energy of 660 ± 20 cm^{-1} which is consistent across the entire set of measured distributions.