Photoelectron kinetic energy dependence in near threshold ionization of NO from A state studied by time-resolved photoelectron imaging

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Photoelectron angular distributions in the laboratory frame (LF-PADs) from the A ($\tilde{\Sigma}^+$) state of NO molecule were measured by femtosecond time-resolved photoelectron imaging (TR-PEI) with (1+1’) resonance enhanced multiphoton ionization via the A state. High-precision measurements of the anisotropy parameters of LF-PADs were performed for the photoelectron kinetic energy from 0.03 to 1.05 eV as a function of the pump-probe delay time. As shown in Fig. 1, the revival feature of the rotational wave packet on the A state was clearly observed in the time-dependence of the photoelectron anisotropy parameters. By approximating the phase shifts of the photoelectron partial waves by the quantum defects in the high-lying Rydberg states using the multichannel quantum defect theory (MQDT), the energy-dependent photoionization transition dipole moments were determined, for the first time, from time-dependent LF-PADs measured by time-resolved photoelectron spectroscopy.

![Fig.1](image)

Fig.1 The photoelectron energy dependence of the time-resolved anisotropy parameters, $\beta_2$ and $\beta_4$, of LF-PADs expressed as $I(\theta, \tau) = 1 + \beta_2(\tau) P_2(\cos \theta) + \beta_4(\tau) P_4(\cos \theta)$ where $\theta$ is the polar angle of the photoelectron $k$-vector with respect to the ionization laser polarization.

Reference