TIME RESOLVED PICOSECOND IR-UV PUMP-PROBE SPECTROSCOPY FOR VIBRATIONAL RELAXATION OF OH SRETCHING MODES OF PHENOL CLUSTERS

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Vibrational relaxation of OH stretching modes of phenol clusters in the electronic ground state has been studied for the first time by picosecond IR-UV pump-probe spectroscopy. Here, OH stretching vibration was pumped by a picosecond IR pulse and the decay of the pumped level as well as the rise of the redistributed levels was observed by means of resonance enhanced multiphoton ionization. For bare phenol, the intramolecular vibrational redistribution (IVR) rate for the OH stretch was determined to be 7.1×10^{10} s^{-1}. In the case of phenol dimer, a remarkable site dependence was observed, i.e. the IVR rate of proton donor OH stretch was greater than $2.0 \times 10^{11} s^{-1}$, while that of the proton acceptor OH stretch was $7.1 \times 10^{10} s^{-1}$. For the both vibrations, vibrational predissociation (VP) takes place after IVR, and the VP rate was obtained to be 1.3×10^{10} and 1.5×10^{10} s^{-1} for the donor and the acceptor OH, respectively. IVR and VP in phenol trimer and phenol-water cluster will also be discussed.