APPLICATION OF TIME-RESOLVED FOURIER-TRANSFORM INFRARED SPECTROSCOPY TO PHOTODISSOCIATION DYNAMICS

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A step-scan time-resolved Fourier-transform infrared spectrometer operated in emission mode was employed to investigate photodissociation dynamics of fluorobenzene (C_6H_5F), fluorotoluene ($CH_3C_6H_4F$), HFCO, and phenol (C_6H_5OH) at 248 nm or 193 nm. We detected emission of HF and CO in the spectral regions 2850-4000 cm^{-1} and 1900-2300 cm^{-1}, respectively, to derive their nascent vibration-rotational population. For dissociation of fluorobenzene and fluorotoluene, HF was produced via the four-center elimination channel on the ground electronic surface. The internal energy distributions of HF are similar for photodissociation of fluorobenzene at 248 nm and 193 nm, and for o-fluorotoluene and p-fluorotoluene at 193 nm. For photolysis of HFCO at 193 nm, product HF is vibrationally inverted, whereas CO is vibrationally cold but rotationally hot, consistent with theoretical predictions. For photolysis of phenol at 193 nm, emission of CO from levels up to v = 3 and J = 70 was observed. Detailed dissociation dynamics will be discussed. If time permits, reaction dynamics of bimolecular reactions involving $O(^1D)$ will also be presented.