FLUORESCENCE EXCITATION SPECTRA OF PHOTO-FRAGMENTED NITROBENZENE USING A PICOSECOND LASER: POTENTIAL EVIDENCE FOR NO PRODUCED BY TWO DISTINCT CHANNELS.

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Upon absorption of a UV photon, nitrobenzene can dissociate into $C_6H_5O$ and NO through two different mechanisms. Evidence for these mechanisms was obtained from velocity map imaging (VMI) studies and theoretical calculations.[a] VMI experiments showed NO produced with two distinct rotational distributions, which the calculations explained as a fast and a slow channel for NO production. We have recorded high resolution fluorescence excitation spectra of the NO resulting from photo-fragmented nitrobenzene using a pulsed picosecond tunable laser (pulse width $\approx$ 15 ps) by means of a two-color process. In the two-color process, photons of a particular energy dissociated the nitrobenzene while photons of a different energy probed the $A^2\Sigma^+ \leftarrow X^2\Pi_{(1/2,3/2)}$ NO band system between 225-260 nm. This laser system allowed us to vary the delay between the photolysis and excitation pulses. At longer delays ($>$1 ns), we observed an increase in the population of NO, which may be evidence that at least two photolysis channels produce NO. We present the spectra we recorded at various photolysis/probe delays ranging from 0.025 to 1.5 ns. The spectral subtraction method we used to observe the production increase is introduced.

[a] Hause, M. L.; Herath, N.; Zhu, R.; Lin, M. C. and Suits, A. G. Nat Chem, Nature Publishing Group, 2011, 3, 932-937