Enhancement of the $NH_2 + NO \rightarrow OH + H + N_2$ Reaction by Vibrational Excitation of NH_2

(Hiroshima Univ., Japan) Nanase KOHNO, Mari IZUMI, Hideo KOBAYASHI, Hiroshi KOHGUCHI, and Katsuyoshi YAMASAKI

(E-mail: d116682@hiroshima-u.ac.jp)

Introduction

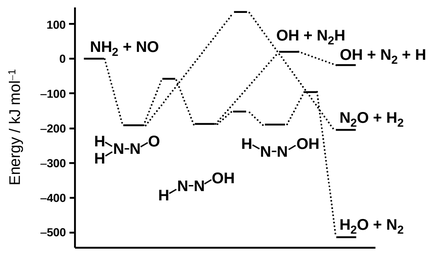
$NH_2 + NO \rightarrow OH + N_2H \rightarrow OH + N_2 + H$ (1)

$\rightarrow N_2O + H_2$ (2)

$\rightarrow H_2O + N_2$ (3)

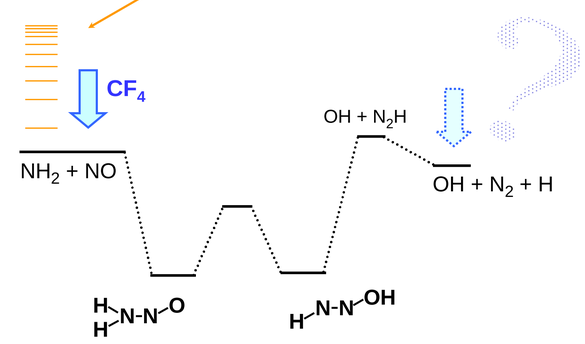
$k = 1.6 \times 10^{-11}$ cm^3 molecule^{-1} s^{-1}

R. Atkinson et al. *Atoms. Chem. Phys.*, **4**, 1461 (2002)



Marcy et al. *J. Phys. Chem. A*, **106**, 8249 (2002)

$NH_3 + h\nu(193\ nm) \rightarrow H + NH_2^*$



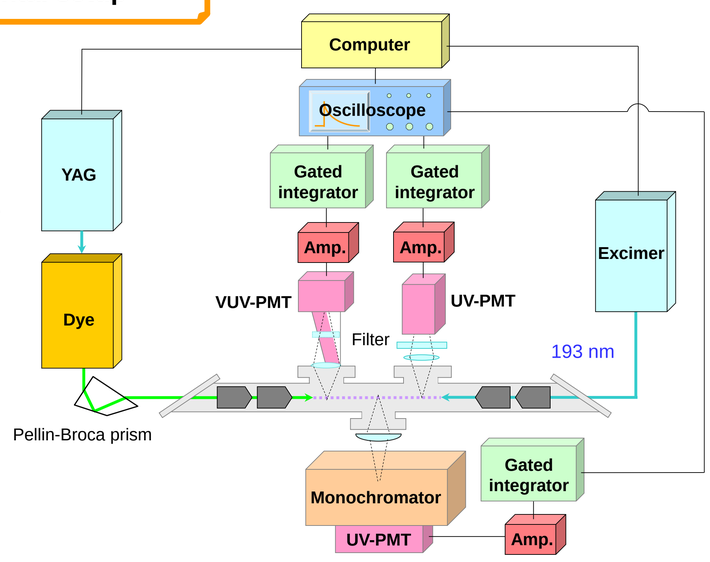
$k_{NH_2(\nu_2=1),\,CF_4} = [3.2 \pm 0.5] \times 10^{-11}$ cm^3 molecule^{-1} s^{-1}

Yamasaki et al. *J. Phys. Chem. A*, **106**, 6563 (2002)

Experimental setup

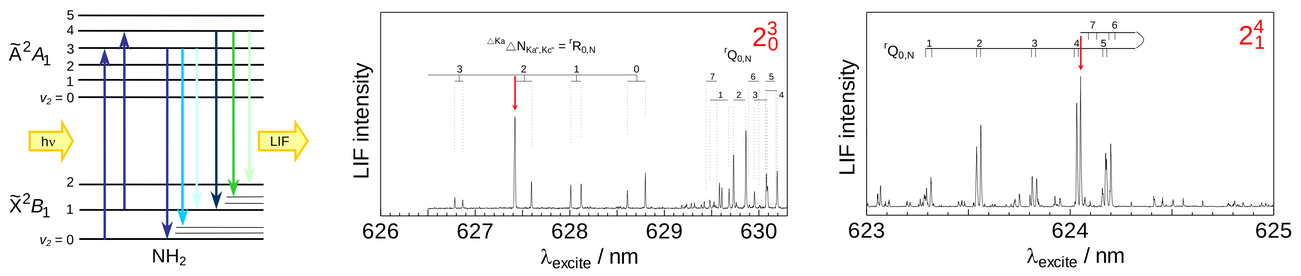
Experimental conditions

- $NH_3/NO/CF_4/He$
- $P_{total}(He) = 5$ Torr
- $p(NH_3) = 0.5$ mTorr
- $p(NO) = 5 \sim 100$ mTorr
- $p(CF_4) = 0 \sim 200$ mTorr

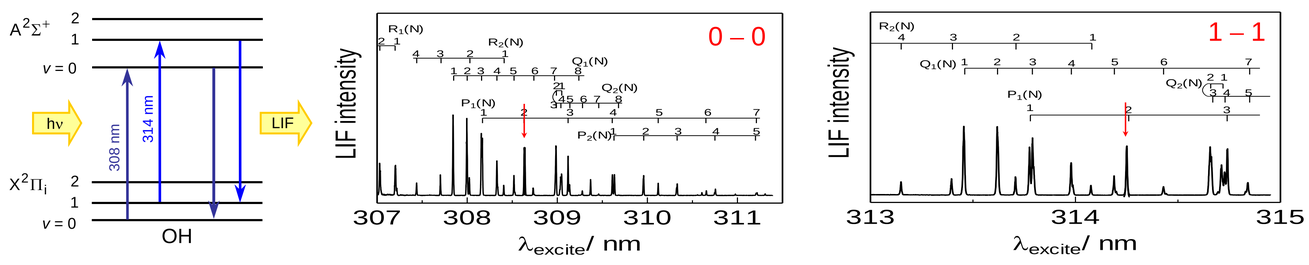


Detection of H, OH(v) and NH_2(v) by the LIF technique

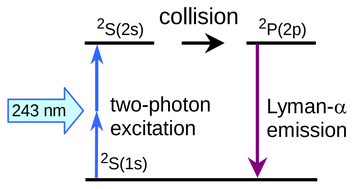
LIF excitation spectra of NH_2 ($\tilde{A}^2A_1 - \tilde{X}^2B_1$)

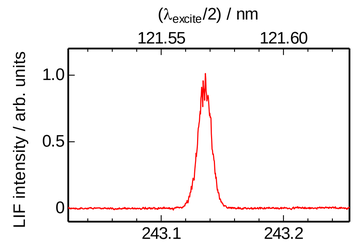


LIF excitation spectra of $OH(A^2\Sigma^+ - X^2\Pi_i)$



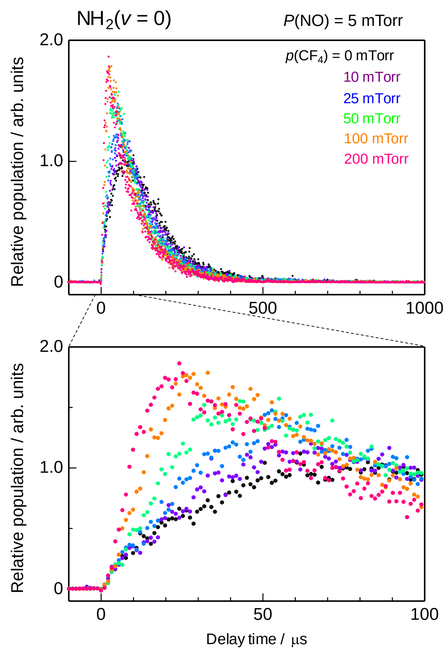
Two-photon LIF excitation spectrum of H atoms

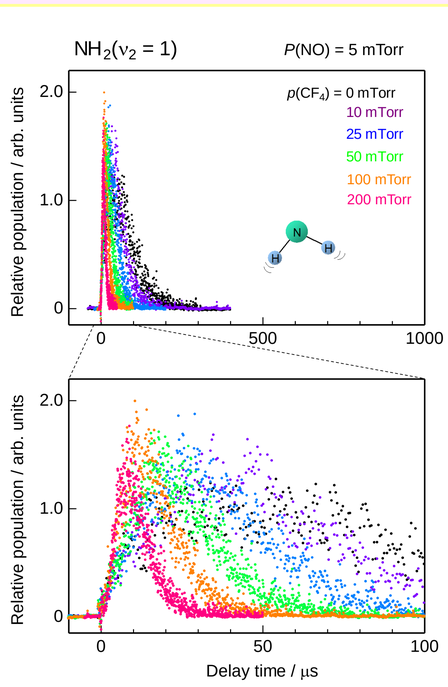




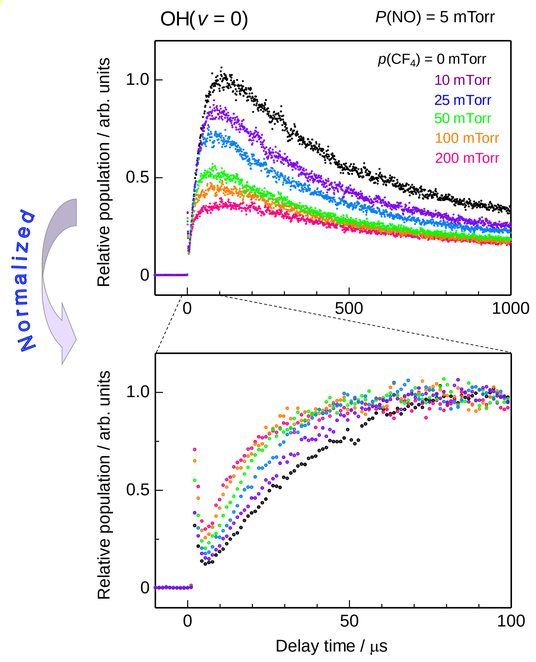
Time resolved LIF intensities

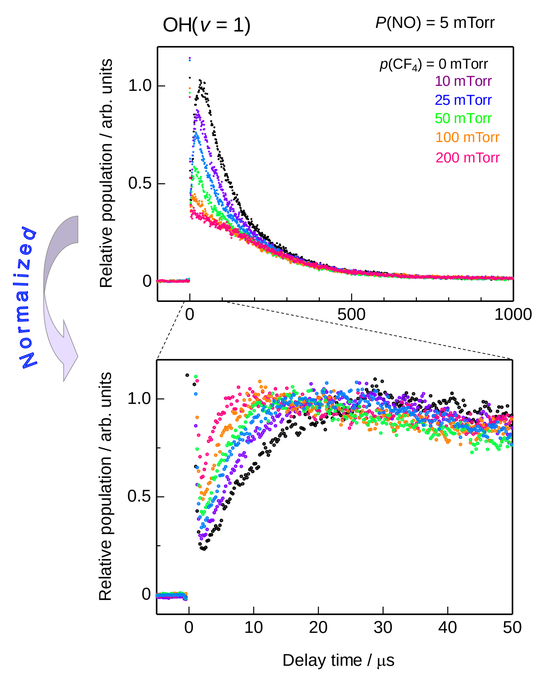
Time profiles of NH_2(v)



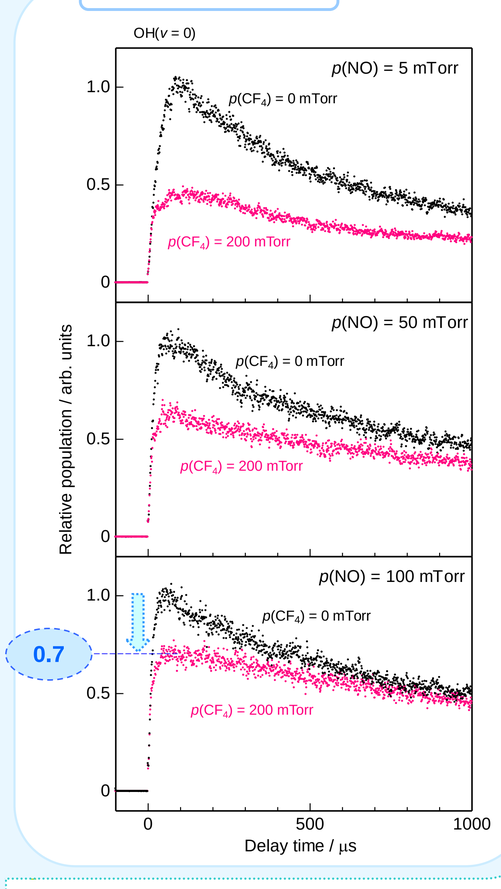


Time profiles of OH(v)





[NO]-dependence

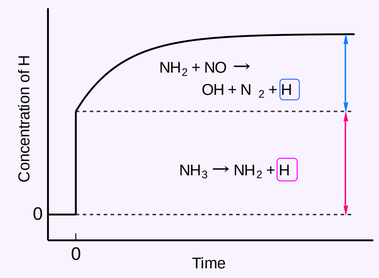


Time profiles of H atoms

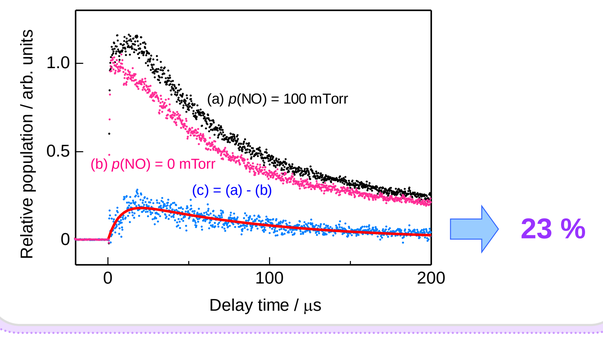
Reaction scheme

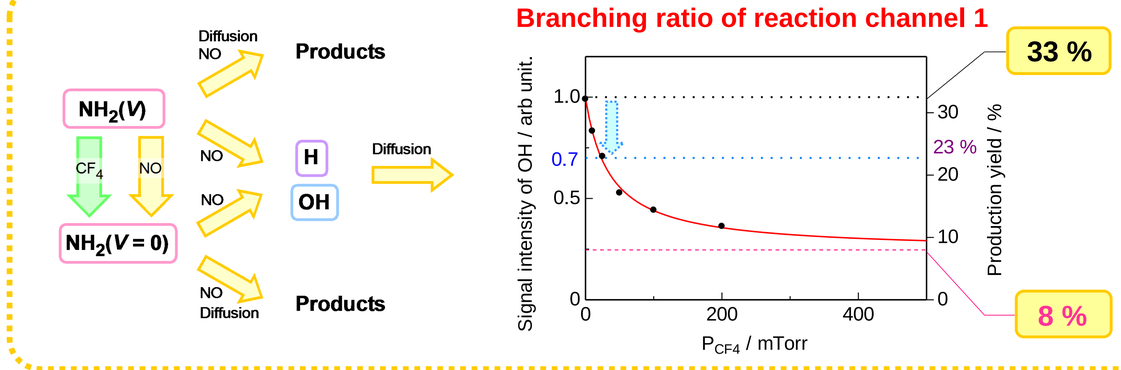
$NH_3 + h\nu \rightarrow NH_2(v) + H$

$NH_2(v) + NO \rightarrow OH + N_2 + H$



Production yield of H atoms





Summary

- LIF detection of H, OH and NH_2 in the NH_2 + NO reaction system.
- Enhancement of the $NH_2 + NO \rightarrow OH + H + N_2$ reaction by vibrational excitation of NH_2. (Observation of the significant reduction of the yield of OH by an addition of CF_4.)