

Table on Flame Measurements of Minor Species

This table is part of the book entitled *Applied Combustion Diagnostics*, edited by K. Kohse-Höinghaus and J.B. Jeffries, for which Dave Crosley and I have contributed Chapter 2 on "Detection of Minor Species with Laser Techniques". The table is intended to be a guide to the best papers for the measurement of minor species concentrations in flames using laser-based diagnostics. Special emphasis is placed on *in-situ* measurements (as opposed to sample-and-detect approaches), in particular on reports of profile measurements obtained under laminar combustion conditions. In general, laser-induced fluorescence is the preferred method when possible, especially when combined with absorption measurements or other calibration schemes to yield quantitative profile data. For this reason LIF papers are listed first, followed by citations to other approaches.

Please note: First observations of a species and first applications of a given technique are not cited when more comprehensive and thorough investigations have subsequently been reported. For the most often studied molecules - OH, CH, and NO - only a few of the many hundreds of LIF papers are included. In contrast, essentially all of the papers are cited for species where few measurements are known. Selected work on spectroscopy and imaging strategies is also listed.

Guide to abbreviations:

*	Wavelengths (nanometers) are given in air, and energies (wavenumbers) are given in vacuum.
ABS	Absorption (see also CRD and TDL)
ASE	Amplified Spontaneous Emission
CARS	Coherent Anti-Stokes Raman Scattering
CRD	Cavity Ringdown
2C-LIGS	Two-Color Laser-Induced Grating Spectroscopy
2C-RFWM	Two-Color Resonant Four-Wave Mixing
DFWM	Degenerate Four-Wave Mixing
EM	Emission
ICLAS	Intracavity Laser Absorption Spectroscopy
LIF	Laser-Induced Fluorescence
MP-LIF	Multiphoton Laser-Induced Fluorescence
OA	Optoacoustic
PAD	Photoacoustic Deflection
PD	Photodissociation
PTD	Photothermal Deflection
POL	Polarization
REMPI	Resonance-Enhanced Multiphoton Ionization
TDL	Tunable Diode Laser

Flame Measurements of Minor Species

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60 Species; 301 references
May 24, 2001

SPECIES	METHOD	EXCITATION		DETECTION		FLAME	REFERENCE
		Transition	Wavelength (nm)*	Transition	Wavelength (nm)		
<u>(A) Species Containing H, C, and O</u>							
H atom	MP-LIF	$3p^2P, 2s^2S-1s^2S$	2 x 243 + 656	$3p^2P - 2s^2S$	656	H ₂ -air [D] H ₂ , CH ₄ , C ₂ H ₂ -O ₂ -Ar [P] H ₂ -O ₂ [P] H ₂ -O ₂ -N ₂ , C ₂ H ₂ -O ₂ -Ar [P] CH ₄ , C ₂ H ₄ , C ₂ H ₆ -O ₂ -Ar [P] H ₂ -O ₂ -Ar [P] H ₂ -O ₂ [P] H ₂ -O ₂ -N ₂ [P] C ₂ H ₄ -O ₂ -Ar [P] H ₂ -O ₂ -Ar [P] H ₂ , CH ₄ , C ₂ H ₂ -O ₂ -Ar [P] C ₃ H ₈ -air [P] H ₂ -O ₂ [P] CH ₄ -N ₂ -O ₂ , Ar [P] C ₂ H ₂ -O ₂ [P] H ₂ , CH ₄ , C ₂ H ₂ -O ₂ -Ar [P] H ₂ +N ₂ /air [D] CH ₄ -O ₂ -NO ₂ -N ₂ [P]	Gol & And 1985 [P,I] Gol 1988 [P] Gol 1989a [P] Gol et al 1990 [P] Ber et al 1993 [P] Luc et al 1983a [P] Gol 1986 [P] Sal & Lau 1986, 1987 [P] Sal & Lau 1988 [P] Bit et al 1988 [P] Gol 1988 [P] Wes et al 1994 [P] Agr et al 1995 [D] Gas et al 1997 [P] Ald et al 1984a [D] Gol 1988 [P] Bro et al 2001 [P] Wil & Fle 1995 [P]
		$3s^2S, 3d^2D-1s^2S$	2 x 205.1	$3s^2S, 3d^2D-2p^2P$	656.3		
		$4p^2P - 1s^2S$	3 x 291.7	$4p^2P - 2s^2S$	486.1		
		$4p^2P, 2s^2S-1s^2S$	2 x 243 + 486	$4p^2P - 2s^2S$	486.1		

	MP-LIF, ASE 2+1 REMPI	$3s^2S - 1s^2S$ $2s^2S - 1s^2S$	2 x 205 2 x 243	$3s^2S - 2p^2P$ Electrons	656	H ₂ -O ₂ [P] H ₂ -O ₂ [P] CH ₄ /air [D] CH ₄ , C ₂ H ₄ , C ₂ H ₆ -O ₂ -Ar [P] H ₂ -O ₂ -Ar [P] H ₂ -O ₂ [P] H ₂ -O ₂ -N ₂ [P]	Gol 1989b [P] Gol 1984 [P] Smy & Tjo 1990a [P] Ber et al 1993 [P] Tjo & Coe 1983 [P] Gra et al 1993 [P] Gra & Tre 1993 [P]
	3+1 REMPI 2C-LIGS DFWM, LIF	$2p^2P - 1s^2S$ $3p^2P, 2s^2S - 1s^2S$ $3p^2P, 2s^2S - 1s^2S$	3 x 364.7 2 x 243 + 656 2 x 243	Electrons $3p^2P - 2s^2S$ Scattered beam	656		
C atom	MP-LIF 2+1 REMPI ASE	$3p^3P - 2p^2^3P$ $3p^3D - 2p^2^3P$ $3p^3P - 2p^2^3P$	2 x 280 2 x 287 2 x 280	$3p^3P - 3s^3P$ Electrons $3p^3P - 3s^3P$	910 910	C ₂ H ₄ -O ₂ -N ₂ [P] CH ₄ , C ₂ H ₄ -air [P] C ₂ H ₂ -O ₂ [P]	Wes et al 1991a [P] Tjo & Smy 1988 [D] Ald et al 1989a [P]
O atom	MP-LIF	$3p^3P - 2p^3P$	2 x 226	$3p^3P - 3s^3S$ $3p^5P - 3s^5S$	845 845, 777 777	C ₂ H ₂ -O ₂ [P] CH ₄ -N ₂ -N ₂ [P] H ₂ -O ₂ [P] H ₂ , CH ₄ , C ₂ H ₂ -O ₂ [P] H ₂ -N ₂ O [P] CH ₄ , C ₂ H ₄ , C ₂ H ₆ -O ₂ -Ar [P] CH ₄ -air [P] CH ₄ -O ₂ -Ar [P] C ₃ H ₈ -air [P] CH ₄ -N ₂ -O ₂ , Ar [P] H ₂ -air [D] CH ₄ -O ₂ [P] H ₂ -O ₂ [P] H ₂ -O ₂ [P] H ₂ -O ₂ [P] H ₂ -O ₂ [P] CH ₄ /air [D] CH ₄ , C ₂ H ₄ , C ₂ H ₆ -O ₂ -Ar [P] CH ₄ -O ₂ -Ar [P] H ₂ -O ₂ [P]	Ald et al 1984b [P] Miz & DeW 1984 [P] Gol 1987 [P] Mei et al 1988 [P] Wes & Ald 1990b [P] Ber et al 1993 [P] van et al 1993 [I] Fei et al 1994 [P] Wes et al 1994 [P] Gas et al 1997 [D] Gol & And 1985 [P,I] Dye & Cro 1989 [S] Wys et al 1989 [D] Ald et al 1989b [P] Agr & Ald 1994 [D] Gol 1984 [P] Smy & Tjo 1990a [P] Ber et al 1993 [P] Fei et al 1994 [P] Das & Bec 1981 [D]
	MP-LIF, ASE	$3p^3P - 2p^3P$	2 x 226	$3p^3P - 3s^3S$	845		
	2+1 REMPI	$3p^3P - 2p^3P$	2 x 226	Electrons			
	Raman	$^3P_2 - ^3P_{2,0}$	158, 227 cm ⁻¹	Scattered light			

	CARS	$\omega_1 - \omega_2$	158, 227 cm^{-1}	ω_3 beam		$\text{H}_2\text{-O}_2$ [P]	Tee & Bec 1981 [D]													
	ICLAS	$2p^1\text{D} - 2p^3\text{P}$	630, 636	Absorption		$\text{H}_2\text{-air}$ [P]	Che & Kov 1994 [D]													
	ASE, gain	$3p^3\text{P} - 2p^3\text{P}$	2 x 226	$3p^3\text{P} - 3s^3\text{S}$	845	$\text{H}_2\text{-O}_2$ [P]	Bro & Jef 1995 [D]													
	DFWM	$3p^3\text{P} - 2p^3\text{P}$	2 x 226	Scattered beam		$\text{H}_2\text{-air}$ [P]	Krü et al 2000 [P]													
C_2	LIF	$d^3\Pi_g - a^3\Pi_u$	514.5	$d^3\Pi_g - a^3\Pi_u$	516.5	$\text{C}_2\text{H}_6\text{-O}_2$ [P]	Vea & Hen 1972 [D]													
			516.5		563.5			$\text{C}_2\text{H}_2\text{-O}_2$ [P]	Bec et al 1974 [D]											
			514.5		516.5			$\text{CH}_4\text{-O}_2$ [P]	Jon & Mac 1976 [D]											
			509-517		555-565			$\text{C}_2\text{H}_2\text{-O}_2$ [P]	Bar & McD 1977 [D]											
			514.5		563.5			$\text{CH}_4\text{-N}_2\text{O-N}_2$ [P]	Van et al 1983 [P]											
			473.7		513			$\text{CH}_4, \dots\text{-O}_2\text{-N}_2 + \text{NO}$ [P]	Wil & Pas 1997 [P]											
	ICLAS CARS DFWM	$e^3\Pi_g - a^3\Pi_u$ $D^1\Sigma_u^+ - B^1\Sigma_g^+$ $d^3\Pi_g - a^3\Pi_u$	248	$e^3\Pi_g - a^3\Pi_u$ $D^1\Sigma_u^+ - X^1\Sigma_g^+$ Absorption	250-400	$\text{C}_3\text{H}_6\text{-O}_2$ [P]	Bro et al 1998 [D]													
			248		232			$\text{C}_3\text{H}_6\text{-O}_2$ [P]	Bro et al 1998 [D]											
			617.3		ω_3 beam Scattered beam			$\text{C}_2\text{H}_2\text{-O}_2$ [P]	Har & Wei 1981 [P]											
			1610-1620 cm^{-1}							$\text{C}_2\text{H}_2\text{-O}_2$ [P]	Att et al 1983 [D]									
			516.5									$\text{C}_2\text{H}_2\text{-O}_2$ [P]	Nyh et al 1994 [D]							
			516.6											$\text{C}_2\text{H}_2\text{-O}_2$ [P]	Kam et al 1997 [D]					
			POL													$d^3\Pi_g - a^3\Pi_u$	516.5	Polarization change	$\text{C}_2\text{H}_2\text{-O}_2$ [P]	Nyh et al 1995a [P]
266, 355, 532	473	$\text{C}_2\text{H}_4\text{-O}_2\text{-N}_2$ [P]	Ben & Ald 1990 [P]																	
266, 292	560	$\text{C}_2\text{H}_2\text{-O}_2\text{-Ar}$ [P]	Gol & Kea 1990 [P]																	
CH	LIF, ABS	$A^2\Delta - X^2\Pi_r$ $B^2\Sigma^- - X^2\Pi_r$	427	$A^2\Delta - X^2\Pi_r$ $B^2\Sigma^- - X^2\Pi_r$	431	$\text{C}_2\text{H}_2\text{-O}_2$ [P]	Bon & Shi 1979 [D]													
			390		?			$\text{CH}_4, \text{CH}_2\text{O-NO}_2\text{-O}_2$ [P]	Bra et al 1991 [P]											
	LIF	$A^2\Delta - X^2\Pi_r$	425	$A^2\Delta - X^2\Pi_r$	423-432	$\text{CH}_4\text{-O}_2$ [P]	Cat et al 1984 [D]													
			431-435		427-428			$\text{C}_2\text{H}_2\text{-O}_2$ [P]	Koh et al 1984 [P]											
			427.4		431.0			CH_4/air [D]	Nor & Smy 1991 [P]											
			431		486			$\text{CH}_4, \text{C}_2\text{H}_4, \text{C}_2\text{H}_6\text{-O}_2\text{-Ar}$ [P]	Ber et al 1993 [P]											
			435.4		431			$\text{CH}_4\text{-O}_2\text{-N}_2$ [P]	Ber et al 2000 [P]											
			$A^2\Delta, B^2\Sigma^- - X^2\Pi_r$		434.4, 387.2			$A^2\Delta, B^2\Sigma^- - X^2\Pi_r$	432, 392	$\text{C}_3\text{H}_8\text{-air}$ [P]	Luq & Cro 1996 [P]									
			$B^2\Sigma^- - X^2\Pi_r$		390			$B^2\Sigma^- - X^2\Pi_r$	390	$\text{CH}_4\text{-O}_2\text{-Ar} + \text{N}_2\text{O, NO, ...}$ [P]	Wil & Fle 1994b [P]									
			387		431			$\text{C}_3\text{H}_8\text{-air}$ [P]	Pau & Dec 1994 [I]											

	2+1 REMPI	$C^1\Sigma^+ - X^1\Sigma^+$	2 x 217.5	Electrons		CH ₄ , C ₂ H ₄ , C ₂ H ₆ -O ₂ -Ar [P]	Ber et al 1993 [P]
	3+2,3 REMPI	$A^1\Pi - X^1\Sigma^+$	3 x 430-470	Electrons		CH ₄ -O ₂ -Ar [P]	Tjo & Smy 1989 [D]
	TDL	(1,0) band	2020-2213 cm ⁻¹	Absorption		CH ₄ -O ₂ -Ar [P]	Tjo & Coe 1984 [P]
			2128 cm ⁻¹			CH ₄ -air [P]	Sch & Han 1981 [P]
			2028,2034 cm ⁻¹			CH ₄ /air [D]	Mil et al 1993 [P]
			2173,2169 cm ⁻¹			CH ₄ -air [P]	Ngu et al 1993 [P]
			2020-2100 cm ⁻¹			C ₂ H ₄ /air [D]	Ska & Mil 1995,1996 [P]
		(2,0) band	4344 cm ⁻¹			CH ₄ -O ₂ -Ar + CF ₃ Br,.. [P]	Dan et al 1996 [P]
		(3,0) band	6412 cm ⁻¹			C ₂ H ₄ -air [P]	Wan et al 2000 [D]
	CARS	$\omega_1 - \omega_2$	2143 cm ⁻¹	ω_3 beam		CH ₄ -air [P]	Ups et al 1999 [D]
			2143 cm ⁻¹			CH ₄ -air [P]	Far et al 1985 [P]
	POL	$B^1\Sigma^+ - X^1\Sigma^+$	2 x 230	Polarization change		C ₃ H ₈ /air [D]	Mag et al 1995 [P]
						CO-O ₂ [P]	Nyh et al 1995b [D]
OH	LIF, ABS	$A^2\Sigma^+ - X^2\Pi_i$	282.9	$A^2\Sigma^+ - X^2\Pi_i$	308	C ₃ H ₈ -air [P]	Kai et al 1986 [P]
			306-309		306-309	H ₂ -O ₂ , H ₂ -N ₂ O [P]	Koh et al 1988 [P]
			285.6		314	CH ₄ /air [D]	Smy et al 1990 [P]
			310		310	C ₂ H ₆ -O ₂ -N ₂ [P]	Car et al 1991 [P]
			309.3		307.1, 312.5	C ₂ H ₆ -O ₂ -N ₂ [P]	Car & Lau 1994 [P]
	LIF	$A^2\Sigma^+ - X^2\Pi_i$	310-312	$A^2\Sigma^+ - X^2\Pi_i$	310-312	H ₂ -O ₂ -Ar [P]	Luc et al 1983b [P]
			313.3		319.5	C ₂ H ₂ -O ₂ [P]	Koh et al 1984 [P]
			281, 306, 612: Five excitation/detection strategies			H ₂ -O ₂ -Ar [P]	Lau & Gol 1989 [P]
			282		315	CH ₄ -air [P]	Koh et al 1990 [P]
			278.8, 283.6		305-385	CH ₄ , C ₂ H ₄ /air [D]	Pur et al 1992 [P]
			248-310: Three excitation/detection strategies			---	Sei & Han 1993 [I]
			287.9		295-340	CH ₄ -air [P]	Ngu et al 1996 [P]
			248.5		295	CH ₄ -air [P]	Ngu & Pau 2001 [D]
			282.6-283.5		295-395	H ₂ + N ₂ /air [D]	Bro et al 2001 [P]
						C ₃ H ₈ -O ₂ [P]	Krö et al 1993 [D]
LIF, DFWM	$A^2\Sigma^+ - X^2\Pi_i$	281.4, 306.4	$A^2\Sigma^+ - X^2\Pi_i$	308.9	NH ₃ -O ₂ -N ₂ [P]	Cho et al 1982 [P]	
ABS	$A^2\Sigma^+ - X^2\Pi_i$	308.6	Absorption		CH ₄ -air [P]	Cat 1982 [P]	
		306.9			H ₂ -O ₂ [P]	Gol 1984 [P]	
		307.4-313.7			CH ₄ -O ₂ -N ₂ [P]	Ros et al 1984 [P]	
OA	$A^2\Sigma^+ - X^2\Pi_i$	308.0, 309.3	Pressure wave				

	PTD	$A^2\Sigma^+ - X^2\Pi_i$	309.0	Beam deflection		C_3H_8 -air [P]	Kiz et al 1984 [P]
	PTD, PAD	$A^2\Sigma^+ - X^2\Pi_i$	309.2	Beam deflection		CH_4 -air/air [P]	Ros & Gup 1984 [P]
	CARS	$\omega_1 - \omega_2$	3065 cm^{-1}	ω_3 beam		CH_4 -air [P]	Att et al 1990 [P]
	CARS, DFWM	$\omega_1 - \omega_2, A - X$	3065 cm^{-1} , 311.2	Scattered beam		CH_4 -air [P]	Ber et al 1992 [P]
	POL	$A^2\Sigma^+ - X^2\Pi_i$	306.4	Polarization change		$C_2H_2-O_2, C_3H_8$ -air [P]	Nyh et al 1993 [P]
			306.4-309.3			CH_4 -air [P]	Suv et al 1995 [D]
			284.9			H_2-N_2O [P]	Löf & Ald 1996 [D]
			308.6			H_2 -air [P]	Rei et al 2000 [D]
	DFWM	$A^2\Sigma^+ - X^2\Pi_i$	309.7	Scattered beam		C_3H_8 -air + SO_2 [P]	Mis et al 1996 [P]
			309.7			H_2 -air + SO_2 [P]	Rad et al 1999 [P]
			308.6, 309.2			H_2 -air [P]	Rei et al 1999 [D]
	CRD	$A^2\Sigma^+ - X^2\Pi_i$	312.2	Absorption		CH_4 -air [P]	Che et al 1998 [P]
	CRD, LIF, ABS	$A^2\Sigma^+ - X^2\Pi_i$	302.4, 304.0	Absorption, $A - X$		H_2, CH_4 -air [P], $CH_4/N_2/O_2$ [D]	Mer et al 1999b [P]
	TDL	(2,0) band	6420 cm^{-1}	Absorption		CH_4 -air [P]	Ups et al 1999 [D]
			6421 cm^{-1}			CH_4 -air [P]	Aiz et al 1999 [D]
	2+1 REMPI	$D^2\Sigma^- - X^2\Pi_i$	2 x 243-247	Electrons		Photolysis	Col et al 1991 [S]
	EM			$A^2\Sigma^+ - X^2\Pi_i$	261-352	H_2-O_2 [P]	Bas & Bro 1953 [S]
C_3	LIF	$\tilde{A}^1\Pi_u - \tilde{X}^1\Sigma_g^+$	370-415	$\tilde{A}^1\Pi_u - \tilde{X}^1\Sigma_g^+$	370-415	CH_4 -He plasma	Bal et al 1994 [S]
			405		423	CH_4-H_2 -Ar plasma	Rai & Jef 1997 [P]
	TDL	ν_3 band	2040 cm^{-1}	Absorption		Photolysis	Mat et al 1988 [S]
	DFWM, 2C-LIGS	$\tilde{A}^1\Pi_u - \tilde{X}^1\Sigma_g^+$	405	Scattered beam		Vaporized jet	But & Roh 1992 [D]
HCO	LIF	$\tilde{B}^2A' - \tilde{X}^2A'$	245	$\tilde{B}^2A' - \tilde{X}^2A'$	276-284	CH_4-O_2 [P]	Jef et al 1990 [P]
			258		340-380	$CH_4-O_2-N_2$ [P]	Dia et al 1998 [P]
			258.4		< 360	CH_4 -air- N_2 [P]	Naj et al 1998 [I]
			258.5		?	CH_4 -air [P]	Bom & Kap 1999 [I]
			254		280-400	CH_4 -air [P]	Naj et al 2001 [I, P]
	2+1 REMPI	$3p^2A' - \tilde{X}^2A'$	2 x 397.4	Electrons		CH_4-O_2 -Ar [P]	Ber et al 1988 [P]
						$CH_4, C_2H_4-O_2$ -Ar [P]	Coo et al 1988 [P]
						$CH_4, C_2H_4, C_2H_6-O_2$ -Ar [P]	Ber et al 1993 [P]
	1+1 REMPI	$3p^2\Pi - \tilde{X}^2A'$	208-222	Electrons		Photolysis	Son & Coo 1992 [S]

	TDL	$\tilde{B}^2A' - \tilde{X}^2A'$	222-263			Photolysis	Coo & Son 1992 [S]
	ICLAS	$\tilde{A}^2A'' - \tilde{X}^2A'$	758	Absorption		Flow reactor	Oh et al 1993 [S]
		$\tilde{A}^2A'' - \tilde{X}^2A'$	615.5-615.8	Absorption		CH ₄ -air [P]	Che 1995 [D]
			615.8			CH ₄ -air [P]	Loz et al 1997 [P]
	CRD	$\tilde{A}^2A'' - \tilde{X}^2A'$	615	Absorption		CH ₄ -O ₂ -N ₂ [P]	Loz et al 1998 [P]
			614.9			CH ₄ -N ₂ -O ₂ [P]	Sch & Rak 1997 [D]
						CH ₄ -O ₂ -Ar [P]	McI 1999 [P]
HO ₂	TDL	ν_3 band	1117.5 cm ⁻¹	Absorption		Photolysis	Thr & Tyn 1982 [D]
		$2\nu_1$ band	6625.8 cm ⁻¹			Photolysis	Joh et al 1991 [S]
						Flow reactor	Taa & Oh 1997 [S]
¹ CH ₂	LIF	$\tilde{b}^1B_1 - \tilde{a}^1A_1$	538	$\tilde{b}^1B_1 - \tilde{a}^1A_1$	450-650	CH ₄ -O ₂ [P]	Sap et al 1990 [P]
	ICLAS	$\tilde{b}^1B_1 - \tilde{a}^1A_1$	612.4	Absorption		CH ₄ -O ₂ -N ₂ [P]	Che et al 1997 [P]
			612.4			CH ₄ -O ₂ -N ₂ [P]	Loz et al 1998 [P]
			590-593,640-645			CH ₄ -O ₂ -N ₂ [P]	Der et al 1999c [P]
	CRD	$\tilde{b}^1B_1 - \tilde{a}^1A_1$	622	Absorption		CH ₄ -O ₂ -Ar [P]	McI 1998,1999 [P]
³ CH ₂	3+1 REMPI	4 states - \tilde{X}^3B_1	385-430	Electrons		Flow reactor	Iri & Hud 1992 [S]
	2+1 REMPI	$\tilde{H}(3p), \tilde{I}(4p) - \tilde{X}^3B_1$	311.8, 269.4	Electrons		Flow reactor	Iri et al 1992 [S]
C ₂ H	LIF	$^2\Pi - \tilde{X}^2\Sigma^+$	250-312	$^2\Pi - \tilde{X}^2\Sigma^+$	400-600	Photolysis	Hsu et al 1992,1993 [S]
	ABS	$\tilde{A}^2\Pi - \tilde{X}^2\Sigma^+$	3000-4200 cm ⁻¹	Absorption		Discharge	Car et al 1982 [S]
	2+1 REMPI	$3p\sigma^2\Pi(?) - \tilde{X}^2\Sigma^+$	2 x 272-283	Electrons		Photolysis	Coo & Goo 1991 [S]
	EM			$^2\Pi - \tilde{X}^2\Sigma^+$	250-300	Discharge	Som et al 1995 [S]
C ₂ O	LIF	$\tilde{A}^3\Pi_i - \tilde{X}^3\Sigma^-$	588-689	$\tilde{A}^3\Pi_i - \tilde{X}^3\Sigma^-$?	Photolysis	Pit et al 1981 [S]
	TDL	ν_1 band	1971 cm ⁻¹	Absorption		Photolysis	Yam et al 1986 [S]

CH ₃	2+1 REMPI	$3p^2A_2^* - \tilde{X}^2A_2^*$	2 x 333.5	Electrons		CH ₄ /air [D] CH ₄ -O ₂ [P] CH ₄ , C ₂ H ₄ -O ₂ -Ar [P] CH ₄ -O ₂ + NO [P] CH ₄ , C ₂ H ₄ , C ₂ H ₆ -O ₂ -Ar [P] Flow reactor	Smy & Tay 1985 [P] Mei & Koh 1987 [P] Coo et al 1988 [P] Etz et al 1992 [P] Ber et al 1993 [P] Hei et al 1994 [S]
	ABS	$\tilde{B}^2A_1 - \tilde{X}^2A_2^*$	216.5	Absorption		CH ₄ -O ₂ [P]	Etz et al 1993 [P]
	DFWM	$\tilde{B}^2A_1 - \tilde{X}^2A_2^*$	217	Scattered beam		CH ₄ -air [P]	Sic et al 1995 [P]
	PD	$\tilde{B}^2A_1 - \tilde{X}^2A_2^*$	205	CH A ² Δ - X ² Π ₇	427	CH ₄ -air, C ₃ H ₈ -air [P]	Far et al 1996 [P]
	CRD	ν_3 band	3125	Absorption		CH ₄ -air [P]	Des et al 1996 [P] Sch et al 1997 [P]
CH ₂ O	LIF	$\tilde{A}^1A_2 - \tilde{X}^1A_1$	352.5	$\tilde{A}^1A_2 - \tilde{X}^1A_1$	395-550	CH ₄ /air [D]	Har & Smy 1993 [P]
			338.1	> 360	Dimethyl ether-air [P]	Pau & Naj 1998 [I]	
			353.0	?	CH ₄ -air [P]	Bom & Kap 1999 [I]	
			369.2-369.7	> 380	CH ₄ -air [P]	Kle et al 2000 [I]	
			353.2	> 375	CH ₄ -air [P]	Böc et al 2000 [I]	
			355	425	C ₂ H ₄ -N ₂ -Ar-air/air [P]	McE & Pfe 2000 [P]	
	339.2	380-500	CH ₄ -air [P]	Shi et al 2001 [P]			
	353.1-353.6	360-550	C ₂ H ₄ , C ₇ H ₁₆ , ...-air [P]	Bur et al 2000 [I]			
	3+1,2 REMPI	$3p_y, 3p_z - \tilde{X}^1A_1$	3 x 445-470	Electrons		Flow cell	Bom & Dou 1987 [S]
	TDL	ν_5 band	2868-2872 cm ⁻¹	Absorption		Cell	Cli & Var 1990 [S]
			2937 cm ⁻¹			Cell	Tol & Mil 1998 [D]
	CRD, LIF	$\tilde{A}^1A_2 - \tilde{X}^1A_1$	368-373	Absorption		CH ₄ -N ₂ -O ₂ [P]	Luq et al 2001b [P]
HCCO	LIF	$\tilde{B}^2\Pi - \tilde{X}^2A'$	284.8-299.3	$\tilde{B}^2\Pi - \tilde{X}^2A'$	375-425	Photolysis	Bro et al 1999 [S]
C ₂ H ₂	LIF, PD	$\tilde{A}^1A_u - \tilde{X}^1\Sigma_g^+$	215.9	C ₂ d-a, C-A	330-650	C ₂ H ₂ -O ₂ [P]	Rai et al 1989 [P]
	CARS	$\omega_1 - \omega_2$	1935-1980 cm ⁻¹	ω_3 beam		C ₂ H ₄ /air [D]	Far et al 1984 [D]
	TDL	$\nu_4 + \nu_5$ band	1273, 1298 cm ⁻¹	Absorption		CH ₄ -C ₂ H ₂ -air [P] C ₂ H ₄ /air [D]	Luc et al 1986 [P] Tol & Mil 1994 [P]

C_2H_3	TDL CRD	CH_2 wag $\tilde{A}^2A'' - \tilde{X}^2A'$	895 cm^{-1} 415-530	Absorption Absorption		Photolysis Photolysis	Kan et al 1990 [S] Pib et al 1999 [S]
CH_3O	LIF REMPI	$\tilde{A}^2A_1 - \tilde{X}^2E$ $? - \tilde{X}^2E$	290-300 297.6 292.8 315-328	$\tilde{A}^2A_1 - \tilde{X}^2E$ Electrons	330-420 350-400 320-400	$CH_4-O_2-N_2-NO_2$ [P] $CH_4-O_2-N_2-NO_2$ [P] CH_4 -air [P] Flow reactor	Wil & Fle 1994a [D,P] Wil & Fle 1995 [P] Naj et al 2001 [I,P] Lon et al 1986 [D]
CH_2OH	2+1 REMPI	$\tilde{B}^2A'(3p) - \tilde{X}^2A''$	2 x 430-490 2 x 450-470 243-251, 2 x 460-505	Electrons		Flow reactor Photolysis Flow reactor	Dul & Hud 1986 [S] Bom et al 1986 [S] Joh & Hud 1996 [S]
$C_2H_2O_2$	LIF	$S_1 - S_0$	428	$S_1 - S_0$	455.5, 477.7	C_2H_2 -air [P]	Tic et al 1998 [I]
C_3H_5 allyl	2+2 REMPI 1+1 REMPI TDL	$3s^2A_1 - \tilde{X}^2A_2$ $\tilde{D}, \tilde{C}, \tilde{B} - \tilde{X}^2A_2$ ν_{11} band	2 x 485-515 2 x 488-513 238-250 795-823 cm^{-1}	Electrons Absorption		Flow reactor Photolysis Flash pyrolysis Photolysis	Hud & Dul 1985 [S] Sap & Wei 1987 [S] Blu et al 1992 [S] Hir et al 1992 [S]
C_4H_7	2+2 REMPI	$3s^2A_1$ Ryd- \tilde{X}	2 x 485-535	Electrons		Flow reactor	Hud & Dul 1985 [S]
C_6H_5 phenyl	CRD	$^2B_1 - ^2A_1$	504.8	Absorption		Photolysis	Yu & Lin 1994 [D]
C_6H_6	Raman 1+1 REMPI	ν_{11} band $S_1 ^1B_{2u} - S_0 ^1A_{1g}$	992 cm^{-1} 233-262	Scattered light Electrons		$CH_4 + C_6H_6$ /air [D] Molecular beam	Get et al 1992 [P] Ich et al 1988 [S]

C ₇ H ₇ benzyl	LIF	$1^2A_2, 2^2B_2 - 1^2B_2$	432-459 425-460	$1^2A_2, 2^2B_2 - 1^2B_2$	464-538 450-500	Flow reactor Photolysis	Oka et al 1982 [S] Fuk & Obi 1990 [S]
	n+1 REMPI	? - \tilde{X}^2B_2''	498-518	Electrons		Flow reactor	Hof & Hud 1985 [S]
tropyl	2+1	np,nf - \tilde{X}^2E_2''	2 x 415-590	Electrons		Flow reactor	Joh 1991 [S]

(B) Nitrogen-Containing Species

N atom	MP-LIF	$3p^4D - 2p^3^4S$	2 x 211	$3p^4D - 3s^4P$	870	H ₂ -O ₂ -N ₂ + NH ₃ ,... [P] H ₂ -O ₂ -N ₂ + NH ₃ ,... [P] NH ₃ -H ₂ -O ₂ [P] NH ₃ -O ₂ [P]	Law et al 1990 [P] Bit et al 1991 [P] Wes et al 1991b [P] Agr et al 1990 [P]
	ASE	$3p^4D - 2p^3^4S$	2 x 211	$3p^4D - 3s^4P$	870		
CN	LIF, ABS	$B^2\Sigma^+ - X^2\Sigma^+$	384.2	$B^2\Sigma^+ - X^2\Sigma^+$	388.3	C ₂ H ₂ -N ₂ O [P]	Bon & Shi 1979 [D]
			386	?		CH ₄ , CH ₂ O-NO ₂ -O ₂ [P]	Bra et al 1991 [P]
	LIF	$B^2\Sigma^+ - X^2\Sigma^+$	421.7; 386.4		388	CH ₄ -NO-O ₂ , CH ₄ -N ₂ O [P]	Zab 1992 [P]
			388.5	$B^2\Sigma^+ - X^2\Sigma^+$	380-390	C ₂ H ₄ -O ₂ -Ar [P]	Mor 1982 [D]
			454.5		384-387	CH ₄ -N ₂ O-N ₂ [P]	Van et al 1983 [P]
			386.7		?	H ₂ -O ₂ -Ar + HCN [P]	Mil et al 1984 [P]
			309-315, 330-335		388	CH ₄ -N ₂ O [P]	Jef et al 1986 [D]
			421.7		388	CH ₄ -NO ₂ -O ₂ [P]	Zab 1991 [P]
			388.5		365-505	CH ₄ -O ₂ + NO [P]	Etz et al 1992 [P]
			356.5		389	CH ₄ -air [P]	Hir & Tsu 1994 [I]
			388.3		420	CH ₄ -O ₂ -NO ₂ -N ₂ [P]	Wil & Fle 1995 [P]
			388.1		320-460	CH ₄ -O ₂ + NO [P]	Juc et al 1998 [P]
			DFWM	$B^2\Sigma^+ - X^2\Sigma^+$	386.0-388.5	Scattered beam	
CRD	$B^2\Sigma^+ - X^2\Sigma^+$	388.3	Absorption		CH ₄ -O ₂ -N ₂ [P]	Luq et al 2001a [P]	
		384.8			CH ₄ -O ₂ + NO [P]	Mer et al 2001b [P]	

NH	LIF, ABS	$A^3\Pi - X^3\Sigma^-$	335.4	$A^3\Pi - X^3\Sigma^-$	337.3	CH ₄ -N ₂ O [P]	And et al 1982a [P]
			337		337	CH ₄ -N ₂ O-Ar [P]	Sal et al 1984 [P]
			336		?	CH ₄ ,CH ₂ O-NO ₂ -O ₂ [P]	Bra et al 1991 [P]
			302.6, 332.7		336	CH ₄ -NO-O ₂ , CH ₄ -N ₂ O [P]	Zab 1992 [P]
	LIF	$A^3\Pi - X^3\Sigma^-$	338.8	$A^3\Pi - X^3\Sigma^-$	337	CH ₄ -N ₂ O [P]	Cop et al 1989 [P]
			338.2		338	CH ₄ -O ₂ -Ar + N ₂ O,NO,.. [P]	Wil & Fle 1994b [P]
			336		336	C ₂ H ₂ ,C ₂ H ₄ -O ₂ -N ₂ + NO [P]	Wil & Pas 1997 [P]
	ABS	$A^3\Pi - X^3\Sigma^-$	332.7	Absorption		NH ₃ -O ₂ -N ₂ [P]	Cho et al 1982 [P]
	DFWM	$A^3\Pi - X^3\Sigma^-$	333.1	Scattered beam		NH ₃ -O ₂ -N ₂ [P]	Rak et al 1990 [P]
	POL	$A^3\Pi - X^3\Sigma^-$	333.2-333.6	Polarization change		NH ₃ -O ₂ [P]	Dre et al 1995 [D]
333.6-336.2					NH ₃ -O ₂ [P]	Suv et al 1995 [D]	
2C-RFWM	$A^3\Pi - X^3\Sigma^-$	333.5-337.7	Scattered beam		NH ₃ -O ₂ [P]	Rad et al 1997 [D]	
CRD	$A^3\Pi - X^3\Sigma^-$	333.8	Absorption		CH ₄ -O ₂ -N ₂ + N ₂ O [P]	Der et al 1999b [P]	
NO	LIF, ABS	$A^2\Sigma^+ - X^2\Pi_i$	236.7	$A^2\Sigma^+ - X^2\Pi_i$	258	NH ₃ -O ₂ -N ₂ , CH ₄ -air [P]	Cho et al 1983 [P]
			LIF		$A^2\Sigma^+ - X^2\Pi_i$	214.3	252.2
			225.8		235-250	CH ₄ -air [P]	Hea et al 1992 [P]
			225.5		234-237	C ₂ H ₆ -O ₂ -N ₂ [P]	Rei et al 1993 [P]
			225.5		234-237	C ₂ H ₆ -O ₂ -N ₂ [P]	Rei & Lau 1994 [D]
			226.0		285-400	CH ₄ -O ₂ -N ₂ [P]	Bat & Han 1995 [I]
			225.5		239	CH ₄ /air [D]	Smy 1996 [P]
			225.9		230-300	CH ₄ -air [P]	Ngu et al 1996 [P]
			225.6		Several λ 's	CH ₄ -O ₂ -N ₂ ,Ar [P]	Par et al 1996 [D]
			225.95-226.15		240-270	CH ₄ -O ₂ -N ₂ [P]	DiR et al 1996 [I]
			225.6		234-237	CH ₄ -O ₂ -N ₂ ,Ar [P]	Tho et al 1997 [D]
			226.0		228-273	CH ₄ -O ₂ -N ₂ [P]	Mok et al 1997 [D]
			226.4		248	CH ₄ /air + NO,NH ₃ [D]	Sic et al 1998 [P]
			225.4		245	CH ₄ -O ₂ -N ₂ + CH ₃ Cl,.. [P]	Des et al 1998 [P]
			247.9		226-260	CH ₄ -air,C ₇ H ₁₆ -air [P]	Sch et al 1999 [I]
			225.5		234-237	C ₂ H ₆ + N ₂ -air [D]	Rav et al 1999 [P]
			226		245	CH ₄ -O ₂ -N ₂ [P]	Gas et al 1999 [P]
			225.5		234-237	CH ₄ /air, C ₂ H ₆ /air [D]	Rav & Lau 2000 [P]
			225.6		230-400	C ₃ H ₆ -air + NO [P]	Ata & Har 2000 [P]

		$D^2\Sigma^+ - X^2\Pi_i$	193.0-193.7	$D^2\Sigma^+ - X^2\Pi_i$	208.0	$C_3H_8-O_2$ [P]	Wod et al 1988 [D]
	1+1 REMPI	$A^2\Sigma^+ - X^2\Pi_i$	270-317	Electrons		H_2 -air- N_2O [P]	Mal & Smy 1982 [D]
	2+2 REMPI	$A^2\Sigma^+ - X^2\Pi_i$	2 x 452	Electrons		CH_4 -air [P]	Roc et al 1982 [P]
	TDL	ν_0 band	1850-1925 cm^{-1}	Absorption		CH_4 -air + NO [P]	Fal et al 1983 [D]
		(3,0) band	5400-5650 cm^{-1}			Cell	Son & All 1997 [D]
	Raman	ν_0 band	~ 1875 cm^{-1}	Scattered light		H_2-N_2O [P]	Van et al 1986 [P]
	DFWM	$A^2\Sigma^+ - X^2\Pi_i$	226	Scattered beam		$H_2/O_2 + N_2$ [D]	Van et al 1992a [S,D]
						$CH_4-O_2-N_2$ [P]	Far & Rak 1999 [S,D]
	POL	$A^2\Sigma^+ - X^2\Pi_i$	226.5-227.1	Polarization change		H_2-N_2O [P]	Löf et al 1996 [D]
NF	ICLAS	$b^1\Sigma^+ - X^3\Sigma^-$	528	Absorption		Photolysis	Pod et al 1997 [D]
NS	LIF	$C^2\Sigma^+ - X^2\Pi_r$	230-232	$C^2\Sigma^+ - X^2\Pi_r$	237.1	$CH_4-N_2O + SF_6, \dots$ [P]	Jef & Cro 1986 [D]
NH ₂	LIF	$\tilde{A}^2A_1 - \tilde{X}^2B_1$	571-662 647.1 600 598	$\tilde{A}^2A_1 - \tilde{X}^2B_1$	516-824 540-550 ? > 620	NH_3-N_2O, O_2 [P] $NH_3, H_2, CH_4-N_2O-N_2$ [P] $CH_4, CH_2O-NO_2-O_2$ [P] $CH_4-O_2-Ar + N$ -fuels [P]	Cop et al 1984 [D] Won et al 1987 [P] Bra et al 1991 [P] Wil & Fle 1997 [P]
	ABS	$\tilde{A}^2A_1 - \tilde{X}^2B_1$	602.7 598	Absorption		NH_3-O_2 [P] $NH_3-O_2-N_2$ [P]	Gre & Mil 1981 [P] Cho et al 1982 [P]
	OA	$\tilde{A}^2A_1 - \tilde{X}^2B_1$	630	Pressure wave		NH_3-O_2 [P]	Smi et al 1983 [D]
	CARS	$\omega_1 - \omega_2$	3220 cm^{-1}	ω_3 beam		Photolysis	Dre & Wol 1984 [D]
	ICLAS	$\tilde{A}^2A_1 - \tilde{X}^2B_1$	597.3	Absorption		$CH_4-O_2-N_2 + N_2O$ [P]	Der et al 1999b [P]
N ₂ O	TDL	$3\nu_3$ band Several bands	6535-6600 cm^{-1} 4922-5108 cm^{-1}	Absorption		Cell Cell	Mih et al 1998a [S] Mih et al 1998b [S]
HCN	LIF	$\tilde{A}^1A'' - \tilde{X}^1\Sigma^+$	193.1, 194.0	$\tilde{A}^1A'' - \tilde{X}^1\Sigma^+$	200-285	Cell	Bar 1979 [S]
	CRD	$\tilde{X}^1\Sigma^+$ overtones	434-572	Absorption		Cell	Rom & Leh 1993 [S]

HNO	LIF	$\tilde{A}^1A'' - \tilde{X}^1A'$	570-640 617.8-619.0	$\tilde{A}^1A'' - \tilde{X}^1A'$	> 640 > 620	Pyrolysis Pyrolysis	Dix & Nob 1979 [S] Dix & Nob 1980 [S]
	ICLAS	$\tilde{A}^1A'' - \tilde{X}^1A'$	618, 642-644 618, 642-644	Absorption		CH ₄ -O ₂ -N ₂ + N ₂ O [P] CH ₄ -O ₂ -N ₂ + NO [P]	Loz & Che 2000 [D] Loz et al 2001 [P]
NCO	LIF	$\tilde{A}^2\Sigma^+ - \tilde{X}^2\Pi_i$	465.8 435-512 466.4 439	$\tilde{A}^2\Sigma^+ - \tilde{X}^2\Pi_i$	430-443 435-465 440 466	CH ₄ -N ₂ O [P] CH ₄ -N ₂ O [P] CH ₄ -O ₂ -Ar + N ₂ O,NO,.. [P] C ₂ H ₂ -O ₂ -N ₂ + NO [P]	And et al 1982b [P] Cop et al 1984 [D] Wil & Fle 1994b [P] Wil & Pas 1997 [P]
		$\tilde{B}^2\Pi - \tilde{X}^2\Pi_i$	314.7-315.2	$\tilde{B}^2\Pi - \tilde{X}^2\Pi_i$	365	CH ₄ -N ₂ O [P]	Jef et al 1986 [D]
NCN	LIF	$A^3\Pi_u - X^3\Sigma_u^-$	315-320	$A^3\Pi_u - X^3\Sigma_u^-$	330 - 440	Discharge	Smi et al 1989 [S]
NO ₂	LIF	?	450-470	?	> 510	CH ₄ -O ₂ -N ₂ -NO ₂ [P]	Bar & Kir 1978 [D]
		?	453	?	500-600	CH ₄ -O ₂ -N ₂ -NO ₂ [P]	Wil & Fle 1995 [P]
	OA	?	485-520,575-620	Pressure wave		CH ₄ -air + NO ₂ [P]	Ten et al 1982 [D]
	PTD	?	490	Beam deflection		CH ₄ -air + CH ₃ NH ₂ [P]	Ros et al 1982 [D]
	DFWM	$\tilde{A}^2B_1 - \tilde{X}^2A_1$	474.4	Scattered beam		C ₃ H ₈ -air + NO ₂ [P]	Man et al 1992,1996 [I]
NH ₃	MP-LIF	$\tilde{C}^1A_1' - \tilde{X}^1A_1$	2 x 305	$\tilde{A}^1A_2'' - \tilde{X}^1A_1$	720	NH ₃ -O ₂ [P]	Wes & Ald 1990a [P]
	DFWM	$\tilde{B}^1E'', \tilde{C}^1A_1' - \tilde{X}^1A_1$	2 x 302-308	Scattered beam		NH ₃ -O ₂ [P]	Geo & Ald 1993 [D]
	POL	$\tilde{B}^1E'', \tilde{C}^1A_1' - \tilde{X}^1A_1$	2 x 307-310	Polarization change		NH ₃ -O ₂ [P]	Nyh et al 1995b [P]
	CARS	$\omega_1 - \omega_2$	3334 cm ⁻¹	ω_3 beam		Cell	Dre & Wol 1984 [D]
	TDL	ν_2 band	925-928 cm ⁻¹	Absorption		Cell	Nec & Wol 1989 [S]
		$\nu_1 + \nu_4, \nu_3 + \nu_4$	5005-5047 cm ⁻¹			Cell	Mih et al 1998b [D]
	$\nu_1 + \nu_3, 2\nu_3$ bands	6529-6678 cm ⁻¹			Cell	Web et al 2001 [D]	

(C) Halogen-Containing Species

HF	DFWM	(1,0),(3,0) bands	870, 2500	Scattered beam		Cell	Van et al 1992b [D]
CCl	LIF	$A^2\Delta - X^2\Pi$	270-285 277.8	$A^2\Delta - X^2\Pi$	278.4 278	CH ₄ +C ₂ H ₅ Cl + He/air [D] CH ₄ -O ₂ -N ₂ + CH ₃ Cl,.. [P]	McE et al 1994 [P] Dev et al 1998 [P]
CF	LIF	$A^2\Sigma^+ - X^2\Pi_i$	224 223.3	$A^2\Sigma^+ - X^2\Pi_i$	254 255	CH ₄ -O ₂ + CHF ₃ ,.. [P] CH ₄ -O ₂ + CHF ₃ ,.. [P]	Esp et al 1997 [D] Esp et al 1999 [P]
CHF	LIF	$\tilde{A}^1A'' - \tilde{X}^1A'$	492.4 492.4	$\tilde{A}^1A'' - \tilde{X}^1A'$	> 515 > 515	CH ₄ -O ₂ + CHF ₃ ,CH ₂ F ₂ [P] CH ₄ -O ₂ + CHF ₃ ,CH ₂ F ₂ [P]	Esp et al 1997 [D] Esp et al 1999 [P]
CF ₂	LIF	$\tilde{A}^1B_1 - \tilde{X}^1A_1$	233 250	$\tilde{A}^1B_1 - \tilde{X}^1A_1$	290 334	C ₂ F ₄ -O ₂ [P] CH ₄ -O ₂ + CHF ₃ ,CH ₂ F ₂ [P]	Dou et al 1996 [P] Esp et al 1999 [P]
FCO	CRD	$\tilde{A}^2\Pi(A'') - \tilde{X}^2A'$	316-338	Absorption		Photolysis	How et al 2000 [S]
CF ₂ O	LIF	(n, π^*) system	216 211.0	(n, π^*) system	? 330-410	C ₂ F ₄ -O ₂ [P] C ₂ F ₄ -O ₂ [P]	Dou et al 1996 [P] Esp et al 1997 [D]
	TDL	ν_4 band	1250-1275 cm ⁻¹	Absorption		CH ₄ -O ₂ -Ar + CF ₃ Br,.. [P]	Dan et al 1996 [P]
CF ₄	TDL	$\nu_3, 2\nu_4$ bands	1250-1280 cm ⁻¹	Absorption		CH ₄ -O ₂ -Ar + CF ₃ Br,.. [P]	Dan et al 1996 [P]
CF ₃ H	TDL	ν_2 band	1075-1100 cm ⁻¹	Absorption		CH ₄ -O ₂ -Ar + CF ₃ Br,.. [P]	Dan et al 1996 [P]

CF ₂ H ₂	TDL	ν_3 band	1075-1120 cm ⁻¹	Absorption		CH ₄ -O ₂ -Ar + CF ₃ Br,.. [P]	Dan et al 1996 [P]
<u>(D) Other Species</u>							
Ar	3+1 REMPI	$3p^5 4s 4s' - 3p^6 1S$	3 x 314.4	Electrons		CH ₄ /air [D]	Smy & Tjo 1990b [P]
Si	2+1 REMPI	$4p^3 P - 3p^2 3P$	2 x 406-410	Electrons		H ₂ +Ar+SiH ₄ /O ₂ +Ar [D]	Zac & Jok 1990 [P]
PO	LIF	$B^2\Sigma^+ - X^2\Pi_r$	324-327	$B^2\Sigma^+ - X^2\Pi_r$	325.0	Discharge	And et al 1984 [D,S]
	1+1 REMPI	$A^2\Sigma^+ - X^2\Pi_r$ $B^2\Sigma^+ - X^2\Pi_r$	245.6-247.8 302-334	$A^2\Sigma^+ - X^2\Pi_r$ Electrons	240	Discharge C ₂ H ₂ -air [P]	Won et al 1986 [D] Smy & Mal 1982 [S]
S ₂	LIF	$B^3\Sigma_u^- - X^3\Sigma_g^-$	296.0	$B^3\Sigma_u^- - X^3\Sigma_g^-$	302.5	H ₂ -O ₂ -N ₂ + H ₂ S [P]	Mul et al 1979 [P]
	DFWM	$B^3\Sigma_u^- - X^3\Sigma_g^-$	309.6	Scattered beam		C ₃ H ₈ -air + SO ₂ [P]	Mis et al 1996 [P]
		$B^3\Sigma_u^- - X^3\Sigma_g^-$	309.6			H ₂ -air + SO ₂ [P]	Rad et al 1999 [P]
SH	LIF	$A^2\Sigma^+ - X^2\Pi_i$	323.7	$A^2\Sigma^+ - X^2\Pi_i$	328.0	H ₂ -O ₂ -N ₂ + H ₂ S [P]	Mul et al 1979 [P]
SO	LIF	$B^3\Sigma^- - X^3\Sigma^-$	266.5	$B^3\Sigma^- - X^3\Sigma^-$	283.4	H ₂ -O ₂ -N ₂ + H ₂ S [P]	Mul et al 1979 [P]
SiO	LIF	$A^1\Pi - X^1\Sigma^+$	227.5-232.9	$A^3\Pi - X^3\Sigma^-$	232	CH ₄ -O ₂ + SiCl ₄ [P]	Hyn 1991 [S]
			231.0		237	H ₂ +Ar+SiH ₄ /O ₂ +Ar [D]	Zac & Bur 1994 [P]
			231		238	H ₂ -O ₂ + HMDS [P]	Glu 2001 [P]
SO ₂	LIF	$\tilde{A}^1B_1 - \tilde{X}^1A_1$	266.5	$\tilde{A}^1B_1 - \tilde{X}^1A_1$	279.3	H ₂ -O ₂ -N ₂ + H ₂ S [P]	Mul et al 1979 [P]

References

- S. Agrup, U. Westblom, and M. Aldén, "Detection of Atomic Nitrogen Using Two-Photon Laser-Induced Stimulated Emission: Application to Flames," *Chemical Physics Letters* 170(1990):406-410.
- S. Agrup and M. Aldén, "Two-Photon Laser-Induced Fluorescence and Stimulated Emission Measurements from Oxygen Atoms in a Hydrogen/Oxygen Flame with Picosecond Resolution," *Optics Communications* 113(1994):315-323.
- S. Agrup, F. Ossler, and M. Aldén, "Measurements of Collisional Quenching of Hydrogen Atoms in an Atmospheric-Pressure Hydrogen Oxygen Flame by Picosecond Laser-Induced Fluorescence," *Applied Physics B* 61(1995):479-487.
- T. Aizawa, T. Kamimoto, and T. Tamaru, "Measurements of OH Radical Concentration in Combustion Environments by Wavelength-Modulation Spectroscopy with a 1.55- μm Distributed-Feedback Diode Laser," *Applied Optics* 38(1999):1733-1741.
- M. Aldén, H. Edner, and S. Svanberg, "Simultaneous, Spatially Resolved Monitoring of C_2 and OH in a $\text{C}_2\text{H}_2/\text{O}_2$ Flame Using a Diode Array Detector," *Applied Physics B* 29(1982):93-97.
- M. Aldén, A.L. Schawlow, S. Svanberg, W. Wendt, and P.-L. Zhang, "Three-Photon-Excited Fluorescence Detection of Atomic Hydrogen in an Atmospheric-Pressure Flame," *Optics Letters* 9(1984a):211-213.
- M. Aldén, H.M. Hertz, S. Svanberg, and S. Wallin, "Imaging Laser-Induced Fluorescence of Oxygen Atoms in a Flame," *Applied Optics* 23 (1984b):3255-3257.
- M. Aldén, S. Wallin, and W. Wendt, "Applications of Two-Photon Absorption for Detection of CO in Combustion Gases," *Applied Physics B* 33(1984c):205-212.
- M. Aldén, P.-E. Bengtsson, and U. Westblom, "Detection of Carbon Atoms in Flames Using Stimulated Emission Induced by Two-Photon Laser Excitation," *Optics Communications* 71(1989a):263-268.
- M. Aldén, U. Westblom, and J.E.M. Goldsmith, "Two-Photon-Excited Stimulated Emission from Atomic Oxygen in Flames and Cold Gases," *Optics Letters* 14(1989b):305-307.
- W.R. Anderson, L.J. Decker, and A.J. Kotlar, "Concentration Profiles of NH and OH in a Stoichiometric $\text{CH}_4/\text{N}_2\text{O}$ Flame by Laser Excited Fluorescence and Absorption," *Combustion and Flame* 48(1982a):179-190 and Erratum 51(1983):125.
- W.R. Anderson, J.A. Vanderhoff, A.J. Kotlar, M.A. DeWilde, and R.A. Beyer, "Intracavity Laser Excitation of NCO Fluorescence in an Atmospheric Pressure Flame," *Journal of Chemical Physics* 77(1982b):1677-1685.

- W.R. Anderson, S.W. Bunte, and A.J. Kotlar, "Measurement of Franck-Condon Factors for the $v' = 0$ Progression in the B-X System of PO," *Chemical Physics Letters* 110(1984):145-149.
- B. Atakan and A.T. Hartlieb, "Laser Diagnostics of NO Reburning in Fuel-Rich Propene Flames," *Applied Physics B* 71(2000):697-702.
- B. Attal, D. Débarre, K. Müller-Dethlefs, and J.P.E. Taran, "Resonance-Enhanced Coherent anti-Stokes Raman Scattering in C_2 ," *Revue de Physique Appliquée* 18(1983):39-50.
- B. Attal-Trétout, S.C. Schmidt, E. Crété, P. Dumas, and J.P. Taran, "Resonance CARS of OH in High-Pressure Flames," *Journal of Quantitative Spectroscopy and Radiative Transfer* 43(1990):351-364.
- W.J. Balfour, J. Cao, C.V.V. Prasad, and C.X.W. Qian, "Laser-Induced Fluorescence Spectroscopy of the $\tilde{A}^1\Pi_u - \tilde{X}^1\Sigma_g^+$ Transition in Jet-Cooled C_3 ," *Journal of Chemical Physics* 101(1994):10343-10349.
- R.H. Barnes and J.F. Kircher, "Laser NO_2 Fluorescence Measurements in Flames," *Applied Optics* 17(1978):1099-1102.
- A.P. Baronavski, "The Fluorescence Spectrum of HCN ($\tilde{A}^1A'' \rightarrow \tilde{X}^1\Sigma^+$) Using ArF Laser Excitation," *Chemical Physics Letters* 61(1979):532-537.
- A.P. Baronavski and J.R. McDonald, "Application of Saturation Spectroscopy to the Measurement of C_2 , $^3\Pi_u$ Concentrations in Oxy-Acetylene Flames," *Applied Optics* 16(1977):1897-1901.
- A.M. Bass and H.P. Broida, "A Spectrophotometric Atlas of the $^2\Sigma^+ - ^2\Pi$ Transition of OH," National Bureau of Standards Circular 541 (1953).
- A.M. Bass and H.P. Broida, "A Spectrophotometric Atlas of the Spectrum of CH from 3000 Å to 5000 Å," National Bureau of Standards Monograph 24 (1961).
- B.E. Battles and R.K. Hanson, "Laser-Induced Fluorescence Measurements of NO and OH Mole Fractions in Fuel-Lean, High-Pressure (1-10 atm) Methane Flames: Fluorescence Modeling and Experimental Validation," *Journal of Quantitative Spectroscopy and Radiative Transfer* 54(1995):521-537.
- K.H. Becker, D. Haaks, and T. Tatarczyk, "Measurements of C_2 Radicals in Flames with a Tunable Dye-Laser," *Zeitschrift für Naturforschung* 29A(1974)829-830.
- P.-E. Bengtsson and M. Aldén, "Optical Investigation of Laser-Produced C_2 in Premixed Sooty Ethylene Flames," *Combustion and Flame* 80(1990):322-328.
- P.A. Berg, D.A. Hill, A.R. Noble, G.P. Smith, J.B. Jeffries, and D.R. Crosley, "Absolute CH Concentration Measurements in Low-Pressure Methane Flames: Comparisons with Model Results," *Combustion and Flame* 121(2000):223-235.
- J.S. Bernstein, X.-M. Song, and T.A. Cool, "Detection of the Formyl Radical in a Methane/Oxygen Flame by Resonance Ionization," *Chemical Physics Letters* 145(1988):188-192.

J.S. Bernstein, A. Fein, J.B. Choi, T.A. Cool, R.C. Sausa, S.L. Howard, R.J. Locke, and A.W. Miziolek, "Laser-Based Flame Species Profile Measurements: A Comparison with Flame Model Predictions," *Combustion and Flame* 92(1993):85-105.

H. Bervas, B. Attal-Trétout, L. Labrunie, and S. Le Boiteux, "Four-Wave Mixing in OH: Comparison between CARS and DFWM," *Il Nuovo Cimento* 14D(1992):1043-1050.

J. Bittner, K. Kohse-Höinghaus, U. Meier, S. Kelm, and Th. Just, "Determination of Absolute H Atom Concentrations in Low-Pressure Flames by Two-Photon Laser-Excited Fluorescence," *Combustion and Flame* 71(1988):41-50.

J. Bittner, A. Lawitzki, U. Meier, and K. Kohse-Höinghaus, "Nitrogen Atom Detection in Low-Pressure Flames by Two-Photon Laser-Excited Fluorescence," *Applied Physics B* 52(1991):108-116.

J.A. Blush, D.W. Minsek, and P. Chen, "Electronic Spectrum of Allyl and Allyl- d_5 Radicals. The $B[1^2A_1] \leftarrow X[1^2A_2]$, $C[2^2B_1] \leftarrow X[1^2A_2]$, and $D[1^2B_2] \leftarrow X[1^2A_2]$ Band Systems," *Journal of Physical Chemistry* 96(1992):10150-10154.

S. Böckle, J. Kazenwadel, T. Kunzelmann, D.-L. Shin, and C. Schulz, "Single-Shot Laser-Induced Fluorescence Imaging of Formaldehyde with XeF Excimer Excitation," *Applied Physics B* 70(2000):733-735.

R. Bombach and B. Käppeli, "Simultaneous Visualisation of Transient Species in Flames by Planar Laser-Induced Fluorescence Using a Single Laser System," *Applied Physics B* 68(1999):251-255.

D.S. Bomse, S. Dougal, and R.L. Woodin, "Multiphoton Ionization Studies of IR Multiphoton Dissociation: Direct C-H Bond Cleavage in Methanol," *Journal of Physical Chemistry* 90(1986):2640-2646.

D.S. Bomse and S. Dougal, "Multiphoton Ionization of Formaldehyde: Observation of the $3p_y$ and $3p_z$ Rydberg States," *Laser Chemistry* 7(1987):35-40.

P.A. Bonczyk and J.A. Shirley, "Measurement of CH and CN Concentration in Flames by Laser-Induced Saturated Fluorescence," *Combustion and Flame* 34(1979):253-264.

M.C. Branch, M.E. Sadeqi, A.A. Alfarayedhi, and P.J. Van Tiggelen, "Measurement of the Structure of Laminar, Premixed Flames of $CH_4/NO_2/O_2$ and $CH_2O/NO_2/O_2$ Mixtures," *Combustion and Flame* 83(1991):228-239.

L.R. Brock, B. Mischler, and E.A. Rohlfing, "Laser-Induced Fluorescence Spectroscopy of the $\tilde{B}^2\Pi - \tilde{X}^2A$ Band System of HCCO and DCCO," *Journal of Chemical Physics* 110(1999):6773-6781.

A. Brockhinke, A.T. Hartlieb, K. Kohse-Höinghaus, and D.R. Crosley, "Tunable KrF Laser-Induced Fluorescence of C_2 in a Sooting Flame," *Applied Physics B* 67(1998):659-665.

A. Brockhinke, A. Bülter, J.C. Rolon, and K. Kohse-Höinghaus, "ps-LIF Measurements of Minor Species Concentration in a Counterflow Diffusion Flame Interacting with a Vortex," *Applied Physics B* 72(2001):491-496.

M.S. Brown and J.B. Jeffries, "Measurement of Atomic Concentrations in Reacting Flows Through the Use of Stimulated Gain or Loss," *Applied Optics* 34(1995):1127-1132.

A. Burkert, D. Grebner, D. Müller, W. Triebel, and J. König, "Single-Shot Imaging of Formaldehyde in Hydrocarbon Flames by XeF Excimer Laser-Induced Fluorescence," *Proceedings of the Combustion Institute* 28(2000):1655-1661.

T.J. Butenhoff and E.A. Rohlffing, "Resonant Four-Wave Mixing Spectroscopy of Transient Molecules in Free Jets," *Journal of Chemical Physics* 97(1992):1595-1598.

P.G. Carrick, J. Pfeiffer, R.F. Curl, Jr., E. Koester, F.K. Tittel and J.V.V. Kasper, "Infrared Absorption Spectrum of C₂H Radical with Color Center Laser," *Journal of Chemical Physics* 76(1982):3336-3337.

C.D. Carter, G.B. King, and N.M. Laurendeau, "Quenching-Corrected Saturated Fluorescence Measurements of the Hydroxyl Radical in Laminar High-Pressure C₂H₆/O₂/N₂ Flames," *Combustion Science and Technology* 78(1991)247-264.

C.D. Carter and N.M. Laurendeau, "Wide- and Narrow-Band Saturated Fluorescence Measurements of Hydroxyl Concentration in Premixed Flames from 1 Bar to 10 Bar," *Applied Physics B* 58(1994):519-528.

R.J. Cattolica, "OH Radical Nonequilibrium in Methane-Air Flat Flames," *Combustion and Flame* 44(1982):43-59.

R.J. Cattolica, D. Stepowski, D. Puechberty, and M. Cottureau, "Laser-Induced Fluorescence of the CH Molecule in a Low-Pressure Flame," *Journal of Quantitative Spectroscopy and Radiative Transfer* 32(1984):363-370.

R.J. Cattolica, J.A. Cavolowsky, and T.G. Mataga, "Laser-Fluorescence Measurements of Nitric Oxide in Low-Pressure H₂/O₂/NO Flames," *Proceedings of the Combustion Institute* 22(1988):1165-1173.

S. Cheskis, "Intracavity Laser Absorption Spectroscopy Detection of HCO Radicals in Atmospheric Pressure Hydrocarbon Flames," *Journal of Chemical Physics* 102(1995):1851-1854.

S. Cheskis and S.A. Kovalenko, "Detection of Atomic Oxygen in Flames by Absorption Spectroscopy," *Applied Physics B* 59(1994):543-546.

S. Cheskis, I. Derzy, V.A. Lozovsky, A. Kachanov, and F. Stoeckel, "Intracavity Laser Absorption Spectroscopy Detection of Singlet CH₂ Radicals in Hydrocarbon Flames," *Chemical Physics Letters* 277(1997):423-429.

S. Cheskis, I. Derzy, V.A. Lozovsky, A. Kachanov, and D. Romanini, "Cavity Ring-Down Spectroscopy of OH Radicals in Low Pressure Flame," *Applied Physics B* 66(1998):377-381.

- M.S. Chou, A.M. Dean, and D. Stern, "Laser Absorption Measurements on OH, NH, and NH₂ in NH₃/O₂ Flames: Determination of an Oscillator Strength for NH₂," *Journal of Chemical Physics* 76(1982):5334-5340.
- M.S. Chou, A.M. Dean, and D. Stern, "Laser-Induced Fluorescence and Absorption Measurements of NO in NH₃/O₂ and CH₄/air Flames," *Journal of Chemical Physics* 78(1983):5962-5970.
- M.-S. Chou and A.M. Dean, "Excimer Laser Perturbations of Methane Flames: High Temperature Reactions of OH and CH," *International Journal of Chemical Kinetics* 17(1985):1103-1118.
- D.S. Cline and P.L. Varghese, "Tunable Diode Laser Measurements of Temperature Dependent Spectral Parameters of Formaldehyde and Methane," *Proceedings of the Combustion Institute* 23(1990):1861-1868.
- M. Collard, P. Kerwin, and A. Hodgson, "Two-Photon Resonance Ionisation Spectroscopy of OH/OD D²Σ⁻," *Chemical Physics Letters* 179(1991):422-428.
- T.A. Cool, J.S. Bernstein, X.-M. Song, and P.M. Goodwin, "Profiles of HCO and CH₃ in CH₄/O₂ and C₂H₄/O₂ Flames by Resonance Ionization," *Proceedings of the Combustion Institute* 22(1988):1421-1432.
- T.A. Cool and P.M. Goodwin, "Observation of an Electronic State of C₂H near 9 eV by Resonance Ionization Spectroscopy," *Journal of Chemical Physics* 94(1991):6978-6988.
- T.A. Cool and X.-M. Song, "Resonance Ionization Spectroscopy of HCO and DCO. II. The \tilde{B}^2A' State," *Journal of Chemical Physics* 96(1992):8675-8683.
- R.A. Copeland, D.R. Crosley, and G.P. Smith, "Laser-Induced Fluorescence Spectroscopy of NCO and NH₂ in Atmospheric Pressure Flames," *Proceedings of the Combustion Institute* 20(1984):1195-1203.
- R.A. Copeland, M.L. Wise, K.J. Rensberger, and D.R. Crosley, "Time Resolved Laser Induced Fluorescence of the NH Radical in Low Pressure N₂O Flames," *Applied Optics* 28(1989):3199-3205.
- R.G. Daniel, K.L. McNesby, and A.W. Miziolek, "Application of Tunable Diode Laser Diagnostics for Temperature and Species Concentration Profiles of Inhibited Low-Pressure Flames," *Applied Optics* 35(1996):4018-4025.
- C.J. Dasch and J.H. Bechtel, "Spontaneous Raman Scattering by Ground-State Oxygen Atoms," *Optics Letters* 6(1981):36-38.
- I. Derzy, V.A. Lozovsky, and S. Cheskis, "Absolute CH Concentration in Flames Measured by Cavity Ring-Down Spectroscopy," *Chemical Physics Letters* 306(1999a):319-324.
- I. Derzy, V.A. Lozovsky, and S. Cheskis, "CH, NH, and NH₂ Concentration Profiles in Methane/Air Flames Doped with N₂O," *Israel Journal of Chemistry* 39(1999b):49-54.

- I. Derzy, V.A. Lozovsky, and S. Cheskis, "Absorption Cross-Sections and Absolute Concentration of Singlet Methylene in Methane/Air Flames," *Chemical Physics Letters* 313(1999c):121-128.
- P. Desgroux, L. Gasnot, B. Crunelle, and J.F. Pauwels, "CH₃ Detection in Flames Using Photodissociation-Induced Fluorescence," *Proceedings of the Combustion Institute* 26(1996):967-974.
- P. Desgroux, P. Devynck, L. Gasnot, J.-F. Pauwels, and L.R. Sochet "Disturbance of Laser-Induced Fluorescence Measurements of NO in Methane-Air Flames Containing Chlorinated Species by Photochemical Effects Induced by 225-nm-laser Radiation," *Applied Optics* 37(1998):4951-4962.
- P. Devynck, P. Desgroux, L. Gasnot, E. Therssen, and J.F. Pauwels, "CCl, CH, and NO LIF Measurements in Methane-Air Flames Seeded with Chlorinated Species: Influence of CH₃Cl and CH₂Cl₂ on CCl and NO Formation," *Proceedings of the Combustion Institute* 27(1998):461-468.
- E.W.-G. Diau, G.P. Smith, J.B. Jeffries, and D.R. Crosley, "HCO Concentration in Flames via Quantitative Laser-Induced Fluorescence," *Proceedings of the Combustion Institute* 27(1998):453-460.
- M.D. DiRosa, K.G. Klavuhn, and R.K. Hanson, "LIF Spectroscopy of NO and O₂ in High-Pressure Flames," *Combustion Science and Technology* 118(1996):257-283.
- R.N. Dixon and M. Noble, "Predissociation in the A¹A" State of HNO," *Laser-Induced Processes in Molecules*, Springer Series in Chemical Physics 6(1979):81-84.
- R.N. Dixon and M. Noble, "The Dipole Moment of HNO in Its A¹A" Excited State Determined Using Optical-Optical Double Resonance Stark Spectroscopy," *Chemical Physics* 50(1980):331-339.
- C.H. Douglas, B.A. Williams, and J.R. McDonald, "Low Pressure Flat Flame Studies of C₂F₄/O₂," *Combustion and Flame* 107(1996):475-478.
- T. Dreier and J. Wolfrum, "Detection of Free NH₂ (\tilde{X}^2B_1) Radicals by CARS Spectroscopy," *Applied Physics B* 33(1984):213-218.
- A. Dreizler, T. Dreier, and J. Wolfrum, "Polarization Spectroscopic Measurement of the NH (A³Π - X³Σ⁻) Transition in an Ammonia/Oxygen Flame," *Journal of Molecular Structure* 349(1995):285-288.
- C.S. Dulcey and J.W. Hudgens, "Multiphoton Ionization Spectroscopy and Vibrational Analysis of a 3p Rydberg State of the Hydroxymethyl Radical," *Journal of Chemical Physics* 84(1986):5262-5270.
- M.J. Dyer and D.R. Crosley, "Doppler-Free Laser-Induced Fluorescence of Oxygen Atoms in an Atmospheric-Pressure Flame," *Optics Letters* 14(1989):12-14.
- D. Espérance, B.A. Williams, and J.W. Fleming, "Detection of Fluorocarbon Intermediates in Low-Pressure Premixed Flames by Laser-Induced Fluorescence," *Chemical Physics Letters* 280(1997):113-118.

- D. Espérance, B.A. Williams, and J.W. Fleming, "Intermediate Species Profiles in Low Pressure Premixed Flames Inhibited by Fluoromethanes," *Combustion and Flame* 117(1999):709-731.
- T. Etzkorn, S. Muris, J. Wolfrum, C. Dembny, H. Bockhorn, P.F. Nelson, A. Attia-Shahin, and J. Warnatz, "Destruction and Formation of NO in Low Pressure Stoichiometric CH₄/O₂ Flames," *Proceedings of the Combustion Institute* 24(1992):925-932.
- T. Etzkorn, J. Fitzer, S. Muris, and J. Wolfrum, "Determination of Absolute Methyl- and Hydroxyl-Radical Concentrations in a Low Pressure Methane-Oxygen Flame," *Chemical Physics Letters* 208(1993):307-310.
- D.A. Everest, C.R. Shaddix, and K.C. Smyth, "Quantitative Two-Photon Laser-Induced Fluorescence Imaging of CO in Flickering CH₄/Air Diffusion Flames," *Proceedings of the Combustion Institute* 26(1996):1161-1169.
- R. Evertsen, R.L. Stolk, and J.J. Ter Meulen, "Investigations of Cavity Ring Down Spectroscopy Applied to the Detection of CH in Atmospheric Flames," *Combustion Science and Technology* 149(1999):19-34.
- P.K. Falcone, R.K. Hanson, and C.H. Kruger, "Tunable Diode Laser Absorption Measurements of Nitric Oxide in Combustion Gases," *Combustion Science and Technology* 35(1983):81-99.
- R.L. Farrow, R.P. Lucht, W.L. Flower, and R.E. Palmer, "Coherent anti-Stokes Raman Spectroscopic Measurements of Temperature and Acetylene Spectra in a Sooting Diffusion Flame," *Proceedings of the Combustion Institute* 20(1984):1307-1312.
- R.L. Farrow, R.P. Lucht, G.L. Clark, and R.E. Palmer, "Species Concentration Measurements Using CARS with Nonresonant Susceptibility Normalization," *Applied Optics* 24(1985):2241-2251.
- R.L. Farrow, M.N. Bui-Pham, and V. Sick, "Degenerate Four-Wave Mixing Measurements of Methyl Radical Distributions in Hydrocarbon Flames: Comparison with Model Predictions," *Proceedings of the Combustion Institute* 26(1996):975-983.
- R.L. Farrow and D.J. Rakestraw, "Analysis of Degenerate Four-Wave Mixing Spectra of NO in a CH₄/N₂/O₂ Flame," *Applied Physics B* 68(1999):741-747.
- A. Fein, J.S. Bernstein, X.-M. Song, and T.A. Cool, "Experiments Concerning Resonance-Enhanced Multiphoton Ionization Probe Measurements of Flames Species Profiles," *Applied Optics* 33(1994):4889-4898.
- M. Fukushima and K. Obi, "Jet Spectroscopy and Excited State Dynamics of Benzyl and Substituted Benzyl Radicals," *Journal of Chemical Physics* 93(1990):8488-8497.
- L. Gasnot, P. Desgroux, J.F. Pauwels, and L.R. Sochet, "Improvement of Two-Photon Laser Induced Fluorescence Measurements of H- and O-atoms in Premixed Methane/Air Flames," *Applied Physics B* 65(1997):639-646.

- L. Gasnot, P. Desgroux, J.F. Pauwels, and L.R. Sochet, "Detailed Analysis of Low-Pressure Premixed Flames of $\text{CH}_4 + \text{O}_2 + \text{N}_2$: A Study of Prompt-NO," *Combustion and Flame* 117(1999):291-306.
- N. Georgiev and M. Aldén, "Two-Photon Degenerate Four-Wave Mixing (DFWM) for the Detection of Ammonia: Applications to Flames," *Applied Physics B* 56(1993):281-286.
- J.D. Getty, S.G. Westre, D.Z. Bezabeh, G.A. Barrall, M.J. Burmeister, and P.B. Kelly, "Detection of Benzene and Trichloroethylene in Sooting Flames," *Applied Spectroscopy* 46(1992):620-625.
- N.G. Glumac, "Formation and Consumption of SiO in Powder Synthesis Flames," *Combustion and Flame* 124(2001):702-711.
- J.E.M. Goldsmith, "Flame Studies of Atomic Hydrogen and Oxygen Using Resonant Multiphoton Optogalvanic Spectroscopy," *Proceedings of the Combustion Institute* 20(1984):1331-1337.
- J.E.M. Goldsmith and R.J.M. Anderson, "Imaging of Atomic Hydrogen in Flames with Two-Step Saturated Fluorescence Detection," *Applied Optics* 24(1985):607-609.
- J.E.M. Goldsmith, "Photochemical Effects in 205-nm, Two-Photon-Excited Fluorescence Detection of Atomic Hydrogen in Flames," *Optics Letters* 11(1986):416-418.
- J.E.M. Goldsmith, "Photochemical Effects in Two-Photon-Excited Fluorescence Detection of Atomic Oxygen in Flames," *Applied Optics* 26(1987):3566-3572.
- J.E.M. Goldsmith, "Multiphoton-Excited Fluorescence Measurements of Atomic Hydrogen in Low-Pressure Flames," *Proceedings of the Combustion Institute* 22(1988):1403-1411.
- J.E.M. Goldsmith, "Photochemical Effects in 243-nm Two-Photon Excitation of Atomic Hydrogen in Flames," *Applied Optics* 28(1989a):1206-1213.
- J.E.M. Goldsmith, "Two-Photon-Excited Stimulated Emission from Atomic Hydrogen in Flames," *Journal of the Optical Society of America B* 6(1989b):1979-1985.
- J.E.M. Goldsmith and D.T.B. Kearsley, " C_2 Creation, Emission, and Laser-Induced Fluorescence in Flames and Cold Gases," *Applied Physics B* 50(1990):371-379.
- J.E.M. Goldsmith, J.A. Miller, R.J.M. Anderson, and L.R. Williams, "Multiphoton-Excited Fluorescence Measurements of Absolute Concentration Profiles of Atomic Hydrogen in Low-Pressure Flames," *Proceedings of the Combustion Institute* 23(1990):1821-1827.
- J.A. Gray and R. Trebino, "Two-Photon-Resonant Four-Wave Mixing Spectroscopy of Atomic Hydrogen in Flames," *Chemical Physics Letters* 216(1993):519-524.
- J.A. Gray, J.E.M. Goldsmith, and R. Trebino, "Detection of Atomic Hydrogen by Two-Color Laser-Induced Grating Spectroscopy," *Optics Letters* 18(1993):444-446.
- R.M. Green and J.A. Miller, "The Measurement of Relative Concentration Profiles of NH_2 Using Laser Absorption Spectroscopy," *Journal of Quantitative Spectroscopy and Radiative Transfer* 13(1981):313-327.

J.E. Harrington and K.C. Smyth, "Laser-Induced Fluorescence Measurements of Formaldehyde in a Methane/Air Diffusion Flame," *Chemical Physics Letters* 202(1993):196-202.

S.J. Harris and A.M. Weiner, "Intracavity Laser Tomography of C₂ in an Oxyacetylene Flame," *Optics Letters* 6(1981):434-436.

J. Haumann, J.M. Seitzman, and R.K. Hanson, "Two-Photon Digital Imaging of CO in Combustion Flows Using Planar Laser-Induced Fluorescence," *Optics Letters* 11(1986):776-778.

D.E. Heard, J.B. Jeffries, G.P. Smith, and D.R. Crosley, "LIF Measurements in Methane/Air Flames of Radicals Important in Prompt-NO Formation," *Combustion and Flame* 88(1992):137-148.

J. Heinze, N. Heberle, and K. Kohse-Höinghaus, "The CH₃ 3p_z²A₂ - \tilde{X}^2A_2 0₀⁰ Band at Temperatures up to 1700 K Investigated by REMPI Spectroscopy," *Chemical Physics Letters* 223(1994):305-312.

A. Hirano and M. Tsujishita, "Visualization of CN by the Use of Planar Laser-Induced Fluorescence in a Cross Section of an Unseeded Turbulent CH₄-Air Flame," *Applied Optics* 33(1994):7777-7780.

E. Hirota, C. Yamada, and M. Okunishi, "Infrared Diode Laser Spectroscopy of the Allyl Radical. The ν_{11} Band," *Journal of Chemical Physics* 97(1992):2963-2970.

M.A. Hoffbauer and J.W. Hudgens, "Multiphoton Ionization Detection of Gas-Phase Benzyl Radicals," *Journal of Physical Chemistry* 89(1985):5152-5154.

W.H. Howie, I.C. Lane, and A.J. Orr-Ewing, "The Near Ultraviolet Spectrum of the FCO Radical: Re-assignment of Transitions and Predissociation of the Electronically Excited State," *Journal of Chemical Physics* 113(2000):7237-7251.

Y.-C. Hsu, P.-R. Wang, M.-C. Yang, D. Papousek, Y.-T. Chen, and W.-Y. Chiang, "Ultraviolet Laser-Induced Fluorescence of the C₂H Radical," *Chemical Physics Letters* 190(1992):507-513.

Y.-C. Hsu, J.J. Lin, D. Papousek, and J.-J. Tsai, "The Low-Lying Bending Vibrational Levels of the CCH ($\tilde{X}^2\Sigma^+$) Radical Studied by Laser-Induced Fluorescence," *Journal of Chemical Physics* 98(1993):6690-6696.

J.W. Hudgens and C.S. Dulcey, "Observation of the 3s ²A₁ Rydberg States of Allyl and Methylallyl Radicals with Multiphoton Ionization Spectroscopy," *Journal of Physical Chemistry* 89(1985):1505-1509.

W.-C. Hung, M.-L. Huang, Y.-C. Lee, and Y.-P. Lee, "Detection of CH in an Oxyacetylene Flame Using Two-Color Resonant Four-Wave Mixing Technique," *Journal of Chemical Physics* 103(1995):9941-9946.

A.J. Hynes, "Laser-Induced Fluorescence of Silicon Monoxide in a Glow Discharge and an Atmospheric Pressure Flame," *Chemical Physics Letters* 181(1991):237-244.

- T. Ichimura, H. Shinohara, and N. Nishi, "Resonance-Enhanced Two-Photon Ionization Spectra of Benzene in the Third Channel Region," *Chemical Physics Letters* 146(1988):83-88.
- K.K. Irikura and J.W. Hudgens, "Detection of CH_2 (\tilde{X}^3B_1) Radicals by 3 + 1 Resonance-Enhanced Multiphoton Ionization Spectroscopy," *Journal of Physical Chemistry* 96(1992):518-519.
- K.K. Irikura, R.D. Johnson III, and J.W. Hudgens, "Two New Electronic States of CH_2 ," *Journal of Physical Chemistry* 96(1992):6131-6133.
- J.B. Jeffries and D.R. Crosley, "Laser-Induced Fluorescence Detection of the NS Radical in Sulfur and Nitrogen Doped Methane Flames," *Combustion and Flame* 64(1986):55-64.
- J.B. Jeffries, R.A. Copeland, G.P. Smith, and D.R. Crosley, "Multiple Species Laser-Induced Fluorescence in Flames," *Proceedings of the Combustion Institute* 21(1986):1709-1718.
- J.B. Jeffries, D.R. Crosley, I.J. Wysong, and G.P. Smith, "Laser-Induced Fluorescence Detection of HCO in a Low-Pressure Flame," *Proceedings of the Combustion Institute* 23(1990):1847-1854.
- R.D. Johnson III, "Excited Electronic States of the Tropylo(cyclo- C_7H_7) Radical," *Journal of Chemical Physics* 95(1991):7108-7113.
- R.D. Johnson III and J.W. Hudgens, "Structural and Thermochemical Properties of Hydroxymethyl (CH_2OH) Radicals and Cations Derived from Observations of $\tilde{B}^2A'(3p) - \tilde{X}^2A'$ Electronic Spectra and from *ab Initio* Calculations," *Journal of Physical Chemistry* 100(1996):19874-19890.
- T.J. Johnson, F.G. Weinhold, J.P. Burrows, G.W. Harris, and H. Burkhard, "Measurements of Line Strengths in the HO_2 ν_1 Overtone Band at 1.5 μm Using an InGaAsP Laser," *Journal of Physical Chemistry* 95(1991):6499-6502.
- R.G. Joklik, J.W. Daily, and W.J. Pitz, "Measurements of CH Radical Concentrations in an Acetylene/Oxygen Flame and Comparisons to Modeling Calculations," *Proceedings of the Combustion Institute* 21(1986):895-904.
- D.G. Jones and J.C. Mackie, "Evaluation of C_2 Resonance Fluorescence as a Technique for Transient Flame Studies," *Combustion and Flame* 27(1976):143-146.
- W. Juchmann, H. Latzel, D.I. Shin, G. Peiter, T. Dreier, H.-R. Volpp, J. Wolfrum, R.P. Lindstedt, and K.M. Leung, "Absolute Radical Concentration Measurements and Modeling of Low-Pressure $\text{CH}_4/\text{O}_2/\text{NO}$ Flames," *Proceedings of the Combustion Institute* 27(1998):469-476.
- E.W. Kaiser, K. Marko, D. Klick, L. Rimai, C.C. Wang, B. Shirinzadeh, and D. Zhou, "Measurement of OH Density Profiles in Atmospheric-Pressure Propane-Air Flames," *Combustion Science and Technology* 50(1986):163-183.
- C.F. Kaminski, I.G. Hughes, and P. Ewart, "Degenerate Four-Wave Mixing Spectroscopy and Spectral Simulation of C_2 in an Atmospheric Pressure Oxy-acetylene Flame," *Journal of Chemical Physics* 106(1997):5324-5332.

- H. Kanamori, Y. Endo, and E. Hirota, "The Vinyl Radical Investigated by Infrared Diode Laser Kinetic Spectroscopy," *Journal of Chemical Physics* 92(1990):197-205.
- B.J. Kirby and R.K. Hanson, "Imaging of CO and CO₂ Using Infrared Planar Laser-Induced Fluorescence," *Proceedings of the Combustion Institute* 28(2000):253-259.
- S.W. Kizirnis, R.J. Brecha, B.N. Ganguly, L.P. Goss, and R. Gupta, "Hydroxyl (OH) Distributions and Temperature Profiles in a Premixed Propane Flame Obtained by Laser Deflection Techniques," *Applied Optics* 23(1984):3873-3880.
- R.J.H. Klein-Douwel, J. Luque, J.B. Jeffries, G.P. Smith, and D.R. Crosley, "Laser-Induced Fluorescence of Formaldehyde Hot Bands in Flames," *Applied Optics* 39(2000):3712-3715.
- K. Kohse-Höinghaus, R. Heidenreich, and Th. Just, "Determination of Absolute OH and CH Concentrations in a Low Pressure Flame by Laser-Induced Saturated Fluorescence," *Proceedings of the Combustion Institute* 20(1984):1177-1185.
- K. Kohse-Höinghaus, J.B. Jeffries, R.A. Copeland, G.P. Smith, and D.R. Crosley, "The Quantitative LIF Determination of OH Concentrations in Low-Pressure Flames," *Proceedings of the Combustion Institute* 22(1988):1857-1866.
- K. Kohse-Höinghaus, U. Meier, and B. Attal-Trétout, "Laser-Induced Fluorescence Study of OH in Flat Flames of 1-10 Bar Compared with Resonance CARS Experiments," *Applied Optics* 29(1990):1560-1569.
- S. Kröll, C. Löfström, and M. Aldén, "Background-Free Species Detection in Sooty Flames Using Degenerate Four-Wave Mixing," *Applied Spectroscopy* 47(1993):1620-1622.
- V. Krüger, S. Le Boiteux, Y.J. Picard, and B. Attal-Trétout, "Atomic Oxygen Detection in Flames Using Two-Photon Degenerate Four-Wave Mixing," *Journal of Physics B* 33(2000):2887-2905.
- N.M. Laurendeau and J.E.M. Goldsmith, "Comparison of Hydroxyl Concentration Profiles Using Five Laser-Induced Fluorescence Methods in a Lean Subatmospheric-Pressure H₂/O₂/Ar Flame," *Combustion Science and Technology* 63(1989):139-152.
- A. Lawitzki, J. Bittner, K. Kohse-Höinghaus, "Determination of N-atom Concentrations in Low-Pressure Premixed H₂/O₂/N₂ Flames Doped with NH₃, HCN, and (CN)₂," *Chemical Physics Letters* 175(1990):429-433.
- S. Linow, A. Dreizler, J. Janicka, and E.P. Hassel, "Comparison of Two-Photon Excitation Schemes for CO Detection in Flames," *Applied Physics B* 71(2000):689-696.
- B. Löfstedt and M. Aldén, "Simultaneous Detection of OH and NO in a Flame Using Polarization Spectroscopy," *Optics Communications* 124(1996):251-257.
- B. Löfstedt, R. Fritzon, and M. Aldén, "Investigation of NO Detection in Flames by the Use of Polarization Spectroscopy," *Applied Optics* 35(1996):2140-2146.

G.R. Long, R.D. Johnson, and J.W. Hudgens, "Detection of Gas-Phase Methoxy Radicals by Resonance-Enhanced Multiphoton Ionization Spectroscopy," *Journal of Physical Chemistry* 90(1986):4901-4903.

V.A. Lozovsky, S. Cheskis, A. Kachanov, and F. Stoeckel, "Absolute HCO Concentration Measurements in Methane/Air Flame Using Intracavity Laser Spectroscopy," *Journal of Chemical Physics* 106(1997):8384-8391.

V.A. Lozovsky, I. Derzy, and S. Cheskis, "Radical Concentration Profiles in a Low-Pressure Methane-Air Flame Measured by Intracavity Laser Absorption and Cavity Ring-Down Spectroscopy," *Proceedings of the Combustion Institute* 27(1998):445-452.

V.A. Lozovsky and S. Cheskis, "Intracavity Laser Absorption Spectroscopy Study of HNO in Hydrocarbon Flames Doped with N₂O," *Chemical Physics Letters* 332(2000):508-514.

V.A. Lozovsky, I. Rahinov, N. Ditzian, and S. Cheskis, "Laser Absorption Spectroscopy Diagnostics of Nitrogen Containing Radicals in Low Pressure Hydrocarbon Flames Doped with Nitrogen Oxides," *Faraday Discussions of the Chemical Society* 119(2001):in press.

R.P. Lucht, J.T. Salmon, G.B. King, D.W. Sweeney, and N.M. Laurendeau, "Two-Photon-Excited Fluorescence Measurement of Hydrogen Atoms in Flames," *Optics Letters* 8(1983a):365-367.

R.P. Lucht, D.W. Sweeney, and N.M. Laurendeau, "Laser-Saturated Fluorescence Measurements of OH Concentration in Flames," *Combustion and Flame* 50(1983b):189-205.

R.P. Lucht, R.L. Farrow, and R.E. Palmer, "Acetylene Measurements in Flames by Coherent Anti-Stokes Raman Scattering," *Combustion Science and Technology* 45(1986):261-274.

J. Luque and D.R. Crosley, "Absolute CH Concentrations in Low-Pressure Flames Measured with Laser-Induced Fluorescence," *Applied Physics B* 63(1996):91-98.

J. Luque, R.J.H. Klein-Douwel, J.B. Jeffries, and D.R. Crosley, "Collisional Processes Near the CH B²Σ⁻ v' = 0,1 Predissociation Limit in Laser-Induced Fluorescence Flame Diagnostics," *Applied Physics B* 71(2000):85-94.

J. Luque, J.B. Jeffries, G.P. Smith, D.R. Crosley, and J.J. Scherer "Combined Cavity Ringdown Absorption and LIF Imaging Measurements of CN(B-X) and CH(B-X) in Low Pressure CH₄-O₂-N₂ and CH₄-NO-O₂-N₂ Flames," *Combustion and Flame* (2001a), in press.

J. Luque, J.B. Jeffries, G.P. Smith, and D.R. Crosley, "Quasi-Simultaneous Detection of CH₂O and CH by Cavity Ringdown Absorption and Laser-Induced Fluorescence in a Methane/Air Low Pressure Flame," *Applied Physics B* (2001b), in press.

P. Magre, F. Aguerre, G. Collin, P. Versaevel, F. Lacas, and J.C. Rolon, "Temperature and Concentration Measurements by CARS in Counterflow Laminar Diffusion Flames," *Experiments in Fluids* 18(1995):376-382.

- W.G. Mallard and K.C. Smyth, "Resonantly Enhanced Two-Photon Photoionization of NO in an Atmospheric Flame," *Journal of Chemical Physics* 76(1982):3483-3492.
- B.A. Mann, S.V. O'Leary, A.G. Astill, and D.A. Greenhalgh, "Degenerate Four-Wave Mixing in Nitrogen Dioxide: Application to Combustion Diagnostics," *Applied Physics B* 54(1992):271-277.
- B.A. Mann, R.F. White, and R.J.S. Morrison, "Detection and Imaging of Nitrogen Dioxide with the Degenerate Four-Wave-Mixing and Laser-Induced Fluorescence Techniques," *Applied Optics* 35(1996):475-481.
- K. Matsumura, H. Kanamori, K. Kawaguchi, and E. Hirota, "Infrared Diode Laser Kinetic Spectroscopy of the ν_3 Band of C_3 ," *Journal of Chemical Physics* 89(1988):3491-3494.
- C.S. McEnally, R.F. Sawyer, C.P. Koshland, and D. Lucas, "In Situ Detection of Hazardous Waste," *Proceedings of the Combustion Institute* 25(1994):325-331.
- C.S. McEnally and L.D. Pfefferle, "Experimental Study of Nonfuel Hydrocarbons and Soot in Coflowing Partially Premixed Ethylene/Air Flames," *Combustion and Flame* 121(2000):575-592.
- A. McIlroy, "Direct Measurement of 1CH_2 in Flames by Cavity Ringdown Laser Absorption Spectroscopy," *Chemical Physics Letters* 296(1998):151-158.
- A. McIlroy, "Laser Studies of Small Radicals in Rich Methane Flames: OH, HCO, and 1CH_2 ," *Israel Journal of Chemistry* 39(1999):55-62.
- U. Meier and K. Kohse-Höinghaus, "REMPI Detection of CH_3 in Low-Pressure Flames," *Chemical Physics Letters* 142(1987):498-502.
- U. Meier, J. Bittner, K. Kohse-Höinghaus, and Th. Just, "Discussion of Two-Photon Laser-Excited Fluorescence as a Method for Quantitative Detection of Oxygen Atoms in Flames," *Proceedings of the Combustion Institute* 22(1988):1887-1896.
- X. Mercier, P. Jamette, J.F. Pauwels, and P. Desgroux, "Absolute CH Concentration Measurements by Cavity Ring-down Spectroscopy in an Atmospheric Diffusion Flame," *Chemical Physics Letters* 305(1999a):334-342.
- X. Mercier, E. Thersson, J.F. Pauwels, and P. Desgroux, "Cavity Ring-Down Measurements of OH Radical in Atmospheric Premixed and Diffusion Flames. A Comparison with Laser-Induced Fluorescence and Direct Laser Absorption," *Chemical Physics Letters* 299(1999b):75-83.
- X. Mercier, E. Thersson, J.F. Pauwels, and P. Desgroux, "Quantitative Features and Sensitivity of Cavity Ring-Down Measurements of Species Concentrations in Flames," *Combustion and Flame* 124(2001a):656-667.
- X. Mercier, L. Pillier, A. El Bakali, M. Carlier, J.F. Pauwels, and P. Desgroux, "NO Reburning Study Based on Species Quantification Obtained by Coupling LIF and Cavity Ring-Down Spectroscopy," *Faraday Discussions of the Chemical Society* 119(2001b):in press.

- R.M. Mihalcea, D.S. Baer, and R.K. Hanson, "A Diode-Laser Absorption Sensor System for Combustion Emission Measurements," *Measurement Science and Technology* 9(1998a):327-338.
- R.M. Mihalcea, M.E. Webber, D.S. Baer, R.K. Hanson, G.S. Feller, and W.B. Chapman "Diode-Laser Absorption Measurements of CO₂, H₂O, N₂O, and NH₃ Near 2.0 μ m," *Applied Physics B* 67(1998b):283-288.
- J.A. Miller, M.C. Branch, W.J. McLean, D.W. Chandler, M.D. Smooke, and R.J. Kee, "The Conversion of HCN to NNO and N₂ in H₂-O₂-HCN-Ar Flames at Low Pressure," *Proceedings of the Combustion Institute* 20(1984):673-684.
- J.H. Miller, S. Elreedy, B. Ahvazi, F. Woldu, and P. Hassanzadeh, "Tunable Diode Laser Measurement of Carbon Monoxide Concentration and Temperature in a Laminar Methane-Air Diffusion Flame," *Applied Optics* 32(1993):6082-6089.
- B. Mischler, P. Beaud, T. Gerber, A.-P. Tzannis, and P.P. Radi, "Degenerate Four-Wave Mixing of S₂ and OH in Fuel-Rich Propane/Air/SO₂ Flames," *Combustion Science and Technology* 119(1996):375-393.
- A.W. Miziolek and M.A. DeWilde, "Multiphoton Photochemical and Collisional Effects During Oxygen-Atom Flame Detection," *Optics Letters* 9(1984):390-392.
- A.V. Mokhov, H.B. Levinsky, and C.E. van der Meij, "Temperature Dependence of Laser-Induced Fluorescence of Nitric Oxide in Laminar Premixed Atmospheric-Pressure Flames," *Applied Optics* 36(1997):3233-3242.
- C. Morley, "The Application of Laser Fluorescence to Detection of Species in Atmospheric Pressure Flames. Relative Quenching Rates of OH by H₂O, H₂, and CO," *Combustion and Flame* 47(1982):67-81.
- C.H. Muller III, K. Schofield, M. Steinberg, and H.P. Broida, "Sulfur Chemistry in Flames," *Proceedings of the Combustion Institute* 17(1979):867-879.
- H.N. Najm, P.H. Paul, C.J. Mueller, and P.S. Wyckoff, "On the Adequacy of Certain Experimental Observables as Measurements of Flame Burning Rate," *Combustion and Flame* 113(1998):312-332.
- H.N. Najm, P.H. Paul, A. McIlroy, and O.M. Knio, "A Numerical and Experimental Investigation of Premixed Methane-Air Flame Transient Response," *Combustion and Flame* 125(2001):879-892.
- H. Neckel and J. Wolfrum, "IR Diode Laser Measurements of the NH₃(ν_2) Band at Different Temperatures," *Applied Physics B* 49(1989):85-89.
- Q.V. Nguyen, R.W. Dibble, D. Hofmann, and S. Kampmann, "Tomographic Measurements of Carbon Monoxide Temperature and Concentration in a Bunsen Flame Using Diode Laser Absorption," *Berichte der Bunsen-gesellschaft für Physikalische Chemie* 97(1993):1634-1642.
- Q.-V. Nguyen and P.H. Paul, "The Time Evolution of a Vortex-Flame Interaction Observed via Planar Imaging of CH and OH," *Proceedings of the Combustion Institute* 26(1996):357-364.

- Q.V. Nguyen, R.W. Dibble, C.D. Carter, G.J. Feichtner, and R.S. Barlow, "Raman-LIF Measurements of Temperature, Major Species, OH, and NO in a Methane-Air Bunsen Flame," *Combustion and Flame* 105(1996):499-510.
- Q.-V. Nguyen and P.H. Paul, "Photochemical Effects of KrF Excimer Excitation in Laser-Induced Fluorescence Measurements of OH in Combustion Environments," *Applied Physics B* 72(2001):497-505.
- T.S. Norton and K.C. Smyth, "Laser-Induced Fluorescence of CH• in a Laminar CH₄/Air Diffusion Flame: Implications for Diagnostic Measurements and Analysis of Chemical Rates," *Combustion Science and Technology* 76(1991):1-20.
- K. Nyholm, R. Maier, C.G. Aminoff, and M. Kaivola, "Detection of OH in Flames by Using Polarization Spectroscopy," *Applied Optics* 32(1993):919-929.
- K. Nyholm, M. Kaivola, and C.G. Aminoff, "Detection of C₂ and Temperature Measurement in a Flame by Using Degenerate Four-Wave Mixing in a Forward Geometry," *Optics Communications* 107(1994):406-410.
- K. Nyholm, M. Kaivola, and C.G. Aminoff, "Polarization Spectroscopy Applied to C₂ Detection in a Flame," *Applied Physics B* 60(1995a):5-10.
- K. Nyholm, R. Fritzon, N. Georgiev, and M. Aldén, "Two-Photon Induced Polarization Spectroscopy Applied to the Detection of NH₃ and CO Molecules in Cold Flows and Flames," *Optics Communications* 114(1995b):76-82.
- D.B. Oh, A.C. Stanton, and J.A. Silver, "Measurement of Formyl Radical Line Strength in the $\tilde{A}^2A' \leftarrow \tilde{X}^2A'$ Band System Using Visible/Near-Infrared Diode Laser Absorption," *Journal of Physical Chemistry* 97(1993):2246-2250.
- T. Okamura, T.R. Charlton, and B.A. Thrush, "Laser-Induced Fluorescence of Benzyl Radicals in the Gas Phase," *Chemical Physics Letters* 88(1982):369-371.
- W.P. Partridge, Jr., M.S. Klassen, D.D. Thomsen, and N.M. Laurendeau, "Experimental Assessment of O₂ Interferences on Laser-Induced Fluorescence Measurements of NO in High-Pressure, Lean Premixed Flames by Use of Narrow-Band and Broadband Detection," *Applied Optics* 35(1996):4890-4904.
- P.H. Paul and J.E. Dec, "Imaging of Reaction Zones in Hydrocarbon-Air Flames by Use of Planar Laser-Induced Fluorescence of CH," *Optics Letters* 19(1994):998-1000.
- P.H. Paul and H.N. Najm, "Planar Laser-Induced Fluorescence Imaging of Flame Heat Release Rate," *Proceedings of the Combustion Institute* 27(1998):43-50.
- K.A. Peterson and D.B. Oh, "High-Sensitivity Detection of CH Radicals in Flames by Use of a Diode-Laser-Based Near-Ultraviolet Light Source," *Optics Letters* 24(1999):667-669.
- C.D. Pibel, A. McIlroy, C.A. Taatjes, S. Alfred, K. Patrick, and J.B. Halpern, "The Vinyl Radical ($\tilde{A}^2A' \leftarrow \tilde{X}^2A'$) Spectrum Between 530 and 415 nm Measured by Cavity Ring-Down Spectroscopy," *Journal of Chemical Physics* 110((1999):1841-1843.

W.M. Pitts, V.M. Donnelley, A.P. Baronavski, and J.R. McDonald, " C_2O ($\tilde{A}^3\Pi_i \leftrightarrow \tilde{X}^3\Sigma^-$): Laser Induced Excitation and Fluorescence Spectra," *Chemical Physics* 61(1981):451-464.

Yu.P. Podmar'kov, M.P. Frolov, and N.N. Yuryshev, "Intracavity Laser Spectroscopy Measurements of the Rate Constant for the $NF + NF$ Reaction," *Chemical Physics Reports* 16(1997):877-882.

R. Puri, M. Moser, R.J. Santoro, and K.C. Smyth, "Laser-Induced Fluorescence Measurements of $OH\cdot$ Concentrations in the Oxidation Region of Laminar, Hydrocarbon Diffusion Flames," *Proceedings of the Combustion Institute* 24(1992):1015-1022.

P.P. Radi, H.-M. Frey, B. Mischler, A.-P. Tzannis, P. Beaud, and T. Gerber, "Stimulated Emission Pumping of OH and NH in Flames by Using Two-Color Resonant Four-Wave Mixing," *Chemical Physics Letters* 265(1997):271-276.

P.P. Radi, B. Mischler, A. Schlegel, A.-P. Tzannis, P. Beaud, and T. Gerber, "Absolute Concentration Measurements Using DFWM and Modeling of OH and S_2 in a Fuel-Rich $H_2/Air/SO_2$ Flame," *Combustion and Flame* 118(1999):301-307.

G.A. Raiche, D.R. Crosley, and R.A. Copeland, "Laser-Induced Fluorescence and Dissociation of Acetylene in Flames," *Advances in Laser Science - IV*, American Institute of Physics Conference Proceedings 191(1989):758-760.

G.A. Raiche and J.B. Jeffries, "Observation and Spatial Distribution of C_3 in a DC Arcjet Plasma During Diamond Deposition Using Laser-Induced Fluorescence," *Applied Physics B* 64(1997):593-597.

D.J. Rakestraw, L.R. Thorne, and T. Dreier, "Detection of NH Radicals in Flames Using Degenerate Four-Wave Mixing," *Proceedings of the Combustion Institute* 23(1990):1901-1907.

R.V. Ravikrishna, C.S. Cooper, and N.M. Laurendeau, "Comparison of Saturated and Linear Laser-Induced Fluorescence Measurements of Nitric Oxide in Counterflow Diffusion Flames," *Combustion and Flame* 117(1999):810-820.

R.V. Ravikrishna and N.M. Laurendeau, "Laser-Induced Fluorescence Measurements and Modeling of Nitric Oxide in Methane-Air and Ethane-Air Counterflow Diffusion Flames," *Combustion and Flame* 120(2000):372-382.

T.A. Reichardt, W.C. Giancola, C.M. Shappert, and R.P. Lucht, "Experimental Investigation of Saturated Degenerate Four-Wave Mixing for Quantitative Concentration Measurements," *Applied Optics* 38(1999):6951-6961.

T.A. Reichardt, W.C. Giancola, and R.P. Lucht, "Experimental Investigation of Saturated Polarization Spectroscopy for Quantitative Concentration Measurements," *Applied Optics* 39(2000):2002-2008.

J.R. Reisel, C.D. Carter, N.M. Laurendeau, and M.C. Drake, "Laser-Saturated Fluorescence Measurements of Nitric Oxide in Laminar, Flat, $C_2H_6/O_2/N_2$ Flames at Atmospheric Pressure," *Combustion Science and Technology* 91(1993):271-295.

- J.R. Reisel and N.M. Laurendeau, "Laser-Induced Fluorescence Measurements and Modeling of Nitric Oxide Formation in High-Pressure Flames," *Combustion Science and Technology* 98(1994):137-160.
- B.H. Rockney, T.A. Cool, and E.R. Grant, "Detection of Nascent NO in a Methane/air Flame by Multiphoton Ionization," *Chemical Physics Letters* 87(1982):141-144.
- D. Romanini and K.K. Lehmann, "Ring-Down Cavity Absorption Spectroscopy of the Very Weak HCN Overtone Bands with Six, Seven, and Eight Stretching Quanta," *Journal of Chemical Physics* 99(1993):6287-6301.
- A. Rose, J.D. Pyrum, C. Muzny, G.J. Salamo, and R. Gupta, "Application of the Photothermal Deflection Technique to Combustion Diagnostics," *Applied Optics* 21(1982):2663-2665.
- A. Rose and R. Gupta, "Combustion Diagnostics by Photo-Deflection Spectroscopy," *Proceedings of the Combustion Institute* 20(1984):1339-1345.
- A. Rose, J.D. Pyrum, G.J. Salamo, and R. Gupta, "Photoacoustic Detection of OH Molecules in a Methane-Air Flame," *Applied Optics* 23(1984):1573-1579.
- J.T. Salmon, R.P. Lucht, D.W. Sweeney, and N.M. Laurendeau, "Laser-Saturated Fluorescence Measurements of NH in a Premixed Subatmospheric CH₄-N₂O-Ar Flame," *Proceedings of the Combustion Institute* 20(1984):1187-1193.
- J.T. Salmon and N.M. Laurendeau, "Quenching-Independent Fluorescence Measurements of Atomic Hydrogen with Photoionization Controlled-Loss Spectroscopy," *Optics Letters* 11(1986):419-421.
- J.T. Salmon and N.M. Laurendeau, "Absolute Concentration Measurements of Atomic Hydrogen in Subatmospheric Premixed H₂/O₂/N₂ Flat Flames with Photoionization Controlled-Loss Spectroscopy," *Applied Optics* 26(1987):2881-2891.
- J.T. Salmon and N.M. Laurendeau, "Concentration Measurements of Atomic Hydrogen in Subatmospheric Premixed C₂H₄-O₂-Ar Flat Flames," *Combustion and Flame* 74(1988):221-231.
- A.D. Sappey and J.C. Weisshaar, "Vibronic Spectrum of Cold, Gas-Phase Allyl Radicals by Multiphoton Ionization," *Journal of Physical Chemistry* 91(1987):3731-3736.
- A.D. Sappey, D.R. Crosley, and R.A. Copeland, "Laser-Induced Fluorescence Detection of Singlet CH₂ in Low-Pressure Methane/Oxygen Flames," *Applied Physics B* 50(1990):463-472.
- J.J. Scherer and D.J. Rakestraw, "Cavity Ringdown Laser Absorption Spectroscopy Detection of Formyl (HCO) Radical in a Low Pressure Flame," *Chemical Physics Letters* 265(1997):169-176.
- J.J. Scherer, K.W. Aniolek, N.P. Cernansky, and D.J. Rakestraw, "Determination of Methyl Radical Concentrations in a Methane/Air Flame by Infrared Cavity Ringdown Laser Absorption Spectroscopy," *Journal of Chemical Physics* 107(1997):6196-6203.

- S.M. Schoenung and R.K. Hanson, "CO and Temperature Measurements in a Flat Flame by Laser Absorption Spectroscopy and Probe Techniques," *Combustion Science and Technology* 24(1981):227-237.
- C. Schulz, V. Sick, U.E. Meier, J. Heinze, and W. Stricker, "Quantification of NO A-X (0,2) Laser-Induced Fluorescence: Investigation of Calibration and Collisional Influences in High-Pressure Flames," *Applied Optics* 38(1999):1434-1443.
- J.M. Seitzman, J. Haumann, and R.K. Hanson, "Quantitative Two-Photon LIF Imaging of Carbon Monoxide in Combustion Gases," *Applied Optics* 26(1987):2892-2899.
- J.M. Seitzman and R.K. Hanson, "Comparison of Excitation Techniques for Quantitative Fluorescence Imaging of Reacting Flows," *AIAA Journal* 31(1993):513-519.
- D.I. Shin, T. Dreier, and J. Wolfrum, "Spatially Resolved Absolute Concentration and Fluorescence-Lifetime Determination of H₂CO in Atmospheric-Pressure CH₄/Air Flames," *Applied Physics B* 72(2001):257-261.
- V. Sick, M.N. Bui-Pham, and R.L. Farrow, "Detection of Methyl Radicals in a Flat Flame by Degenerate Four-Wave Mixing," *Optics Letters* 20(1995):2036-2038.
- V. Sick, F. Hildenbrand, and P. Lindstedt, "Quantitative Laser-Based Measurements and Detailed Chemical Kinetic Modeling of Nitric Oxide Concentrations in Methane-Air Counterflow Diffusion Flames," *Proceedings of the Combustion Institute* 27(1998):1401-1409.
- R.R. Skaggs and J.H. Miller, "A Study of Carbon Monoxide in a Series of Laminar Ethylene/Air Diffusion Flames Using Tunable Diode Laser Absorption Spectroscopy," *Combustion and Flame* 100(1995):430-439.
- R.R. Skaggs and J.H. Miller, "Tunable Diode Laser Absorption Measurements of Carbon Monoxide and Temperature in a Time-Varying, Methane/Air, Non-Premixed Flame," *Proceedings of the Combustion Institute* 26(1996):1181-1188.
- G.P. Smith, M.J. Dyer, and D.R. Crosley, "Pulsed Laser Optoacoustic Detection of Flame Species," *Applied Optics* 22(1983):3995-4003.
- G.P. Smith, R.A. Copeland, and D.R. Crosley, "Electronic Quenching, Fluorescence Lifetime, and Spectroscopy of the A³Π_u State of NCN," *Journal of Chemical Physics* 91(1989):1987-1993.
- K.C. Smyth and W.G. Mallard, "Two-Photon Ionization Processes of PO in a C₂H₂/Air Flame," *Journal of Chemical Physics* 77(1982):1779-1787.
- K.C. Smyth and P.H. Taylor, "Detection of the Methyl Radical in a Methane/Air Diffusion Flame by Multiphoton Ionization Spectroscopy," *Chemical Physics Letters* 122(1985):518-522.
- K.C. Smyth and P.J.H. Tjossem, "Relative H-Atom and O-Atom Concentration Measurements in a Laminar, Methane/Air Diffusion Flame," *Proceedings of the Combustion Institute* 23(1990a):1829-1837.
- K.C. Smyth and P.J.H. Tjossem, "Signal Detection Efficiency in Multiphoton Ionization Flame Measurements," *Applied Optics* 29(1990b):4891-4898.

- K.C. Smyth, P.J.H. Tjossem, A. Hamins, and J.H. Miller, "Concentration Measurements of OH \cdot and Equilibrium Analysis in a Laminar Methane/Air Diffusion Flame," *Combustion and Flame* 79(1990):366-380.
- K.C. Smyth, "NO Production and Destruction in a Methane/Air Diffusion Flame," *Combustion Science and Technology* 115(1996):151-176.
- E. Somé, F. Remy, D. Macau-Hercot, I. Dubois, J. Breton, and H. Bredohl, "The Near UV Spectrum of C₂H," *Journal of Molecular Spectroscopy* 173(1995):44-48.
- X.-M. Song and T.A. Cool, "Resonance Ionization Spectroscopy of HCO and DCO. I. The 3p²Π Rydberg State," *Journal of Chemical Physics* 96(1992):8664-8674.
- D.M. Sonnenfroh and M.G. Allen, "Absorption Measurements of the Second Overtone Band of NO in Ambient and Combustion Gases with a 1.8-μm Room-Temperature Diode Laser," *Applied Optics* 36(1997):7970-7977.
- A.A. Suvernev, A. Dreizler, T. Dreier, and J. Wolfrum, "Polarization-Spectroscopic Measurement and Spectral Simulation of OH (A²Σ-X²Π) and NH (A³Π-X³Σ) Transitions in Atmospheric Pressure Flames," *Applied Physics B* 61(1995):421-427.
- C.A. Taatjes and D.B. Oh, "Time-Resolved Wavelength Modulation Spectroscopy Measurements of HO₂ Kinetics," *Applied Optics* 24(1997):5817-5821.
- R.E. Teets and J.H. Bechtel, "Coherent anti-Stokes Raman Spectra of Oxygen Atoms in Flames," *Optics Letters* 6(1981):458-460.
- K. Tannel, G.J. Salamo, and R. Gupta, "Minority Species Concentration Measurements in Flames by the Photoacoustic Technique," *Applied Optics* 21(1982):2133-2140.
- J.W. Thoman, Jr. and A. McIlroy, "Absolute CH Radical Concentrations in Rich Low-Pressure Methane-Oxygen-Argon Flames via Cavity Ringdown Spectroscopy of the A²Δ-X²Π Transition," *Journal of Physical Chemistry A* 104(2000):4953-4961.
- D.D. Thomsen, F.F. Kuligowski, and N.M. Laurendeau, "Background Corrections for Laser-Induced-Fluorescence Measurements of Nitric Oxide in Lean, High-Pressure, Premixed Methane Flames," *Applied Optics* 36(1997):3244-3252.
- B.A. Thrush and G.S. Tyndall, "Reactions of HO₂ Studied by Flash Photolysis with Diode-Laser Spectroscopy," *Journal of the Chemical Society: Faraday Transactions* 2 78(1982):1469-1475.
- F.E. Tichy, T. Bjorge, B.F. Magnussen, P.E. Bengtsson, and F. Mauss, "Two-Dimensional Imaging of Glyoxal (C₂H₂O₂) in Acetylene Flames Using Laser-Induced Fluorescence," *Applied Physics B* 66(1998):115-199.
- P.J.H. Tjossem and T.A. Cool, "Detection of Atomic Hydrogen in Flames by Resonance Four-Photon Ionization at 365 nm," *Chemical Physics Letters* 100(1983):479-483.
- P.J.H. Tjossem and T.A. Cool, "Species Density Measurements with the REMPI Method; the Detection of CO and C₂O in a Methane/Oxygen Flame," *Proceedings of the Combustion Institute* 20(1984):1321-1329.

- P.J.H. Tjossem and K.C. Smyth, "Multiphoton Ionization Detection of CH, Carbon Atoms, and O₂ in Premixed Hydrocarbon Flames," *Chemical Physics Letters* 144(1988):51-57.
- P.J.H. Tjossem and K.C. Smyth, "Multiphoton Excitation Spectroscopy of the B¹Σ⁺ and C¹Σ⁺ Rydberg States of CO," *Journal of Chemical Physics* 91(1989):2041-2048.
- M.P. Tolocka and J.H. Miller, "Detection of Polyatomic Species in Non-Premixed Flames Using Tunable Diode Laser Absorption Spectroscopy," *Microchemical Journal* 50(1994):397-412.
- M.P. Tolocka and J.H. Miller, "Measurements of Formaldehyde Concentrations and Formation Rates in a Methane-Air, Non-Premixed Flame and Their Implications for Heat-Release Rate," *Proceedings of the Combustion Institute* 27(1998):633-640
- S.J. Tsay, K.G. Owens, K.W. Aniolek, D.L. Miller, and N.P. Cernansky, "Detection of CN by Degenerate Four-Wave Mixing," *Optics Letters* 20(1995):1725-1727.
- B.L. Upschulte, D.M. Sonnenfroh, and M.G. Allen, "Measurements of CO, CO₂, OH, and H₂O in Room-Temperature and Combustion Gases by Use of a Broadly Current-Tuned InGaAsP Diode Laser," *Applied Optics* 38(1999):1506-1512.
- J.A. Vanderhoff, R.A. Beyer, A.J. Kotlar, and W.R. Anderson, "Ar⁺ Laser-Excited Fluorescence of C₂ and CN Produced in a Flame," *Combustion and Flame* 49(1983):197-206.
- J.A. Vanderhoff, S.W. Bunte, A.J. Kotlar, and R.A. Beyer, "Temperature and Concentration Profiles in Hydrogen-Nitrous Oxide Flames," *Combustion and Flame* 65(1986):45-51.
- R.L. Vander Wal, R.L. Farrow, and D.J. Rakestraw, "High-Resolution Investigation of Degenerate Four-Wave Mixing in the γ(0,0) Band of Nitric Oxide," *Proceedings of the Combustion Institute* 24(1992a):1653-1659.
- R.L. Vander Wal, B.E. Holmes, J.B. Jeffries, P.M. Danehy, R.L. Farrow, and D.J. Rakestraw, "Detection of HF Using Degenerate Four-Wave Mixing," *Chemical Physics Letters* 191(1992b):251-258.
- D.L. van Oostendorp, H.B. Levinsky, C.E. van der Meij, R.A.A.M. Jacobs, and W.T.A. Borghols, "Avoidance of the Photochemical Production of Oxygen Atoms in One-Dimensional, Two-Photon Laser-Induced Fluorescence Imaging," *Applied Optics* 32(1993):4636-4640.
- C.J. Vear and P.J. Hendra, "Laser Raman and Resonance Fluorescence Spectra of Flames," *Journal of the Chemical Society - Chemical Communications* (1972):381-382.
- J. Wang, M. Maiorov, D.S. Baer, D.Z. Garbuzov, J.C. Connolly, and R.K. Hanson, "In Situ Combustion Measurements of CO with Diode-Laser Absorption near 2.3 μm," *Applied Optics* 39(2000):5579-5589.
- M.E. Webber, D.S. Baer, and R.K. Hanson, "Ammonia Monitoring Near 1.5 μm with Diode-Laser Absorption Sensors," *Applied Optics* 40(2001):2031-2042.

- U. Westblom and M. Aldén, "Laser-Induced Fluorescence Detection of NH_3 in Flames with the Use of Two-Photon Excitation," *Applied Spectroscopy* 44(1990a):881-886.
- U. Westblom and M. Aldén, "Simultaneous Multiple Species Detection in a Flame Using Laser-Induced Fluorescence," *Applied Optics* 29(1990b):4844-4851; Errata for *Applied Optics* 28(1989):2592-2599.
- U. Westblom, S. Agrup, M. Aldén, H.M. Hertz, and J.E.M. Goldsmith, "Properties of Laser-Induced Stimulated Emission for Diagnostic Purposes," *Applied Physics B* 50(1990):487-497.
- U. Westblom, P.-E. Bengtsson, and M. Aldén, "Carbon Atom Fluorescence and C_2 Emission Detected in Fuel-Rich Flames Using a UV Laser," *Applied Physics B* 52(1991a):371-375.
- U. Westblom, S. Agrup, M. Aldén, and P. Cederbalk, "Detection of Nitrogen Atoms in Flames Using Two-Photon Laser-Induced Fluorescence and Investigations of Photochemical Effects," *Applied Optics* 30(1991b):2990-3002.
- U. Westblom, F. Fernandez-Alonso, C.R. Mahon, G.P. Smith, J.B. Jeffries, and D.R. Crosley, "Laser-Induced Fluorescence Diagnostics of a Propane/Air Flame with Manganese Fuel Additive," *Combustion and Flame* 99(1994):261-268.
- B.A. Williams and J.W. Fleming, "LIF Detection of Methoxy in $\text{CH}_4/\text{O}_2/\text{NO}_2/\text{N}_2$ Flames," *Chemical Physics Letters* 221(1994a):27-32.
- B.A. Williams and J.W. Fleming, "Comparative Species Concentrations in $\text{CH}_4/\text{O}_2/\text{Ar}$ Flames Doped with N_2O , NO , and NO_2 ," *Combustion and Flame* 98(1994b):93-106.
- B.A. Williams and J.W. Fleming, "Comparison of Species Profiles between O_2 and NO_2 Oxidizers in Premixed Methane Flames," *Combustion and Flame* 100(1995):571-590.
- B.A. Williams and J.W. Fleming, "Radical Species Profiles in Low-Pressure Methane Flames Containing Fuel Nitrogen Compounds," *Combustion and Flame* 110(1997):1-13.
- B.A. Williams and L. Pasternack, "The Effect of Nitric Oxide on Premixed Flames of CH_4 , C_2H_6 , C_2H_4 , and C_2H_2 ," *Combustion and Flame* 111(1997):87-110.
- S. Williams, D.S. Green, S. Sethuraman, and R.N. Zare, "Detection of Trace Species in Hostile Environments Using Degenerate Four-Wave Mixing: CH in an Atmospheric-Pressure Flame," *Journal of the American Chemical Society* 114(1992):9122-9130.
- A.M. Wodtke, L. Huwel, H. Schluter, G. Meijer, P. Anderson, and H. Voges, "High-Sensitivity Detection of NO in a Flame Using a Tunable ArF Laser," *Optics Letters* 13(1988):910-912.
- K.N. Wong, W.R. Anderson, and A.J. Kotlar, "Radiative Processes Following Laser Excitation of the $A^2\Sigma^+$ State of PO," *Journal of Chemical Physics* 85(1986):2406-2413.

K.N. Wong, W.R. Anderson, J.A. Vanderhoff, and A.J. Kotlar, "Kr⁺ Laser Excitation of NH₂ in Atmospheric Pressure Flames," *Journal of Chemical Physics* 86(1987):93-101.

I.J. Wysong, J.B. Jeffries, and D.R. Crosley, "Laser-Induced Fluorescence of O (3p³P), O₂, and NO Near 226 nm: Photolytic Interferences and Simultaneous Excitation in Flames," *Optics Letters* 14(1989):767-769.

C. Yamada, H. Kanamori, H. Horiguchi, S. Tsuchiya, and E. Hirota, "Infrared Diode Laser Kinetic Spectroscopy of the CCO Radical in the $\tilde{X}^3\Sigma^-$ State Generated by the Excimer Laser Photolysis of Carbon Suboxide," *Journal of Chemical Physics* 84(1986):2573-2576.

T. Yu and M.C. Lin, "Kinetics of the C₆H₅ + NO Association Reaction," *Journal of Physical Chemistry* 98(1994):2105-2109.

S. Zabarnick, "Laser-Induced Fluorescence Diagnostics and Chemical Kinetic Modeling of a CH₄/NO₂/O₂ Flame at 55 Torr," *Combustion and Flame* 85(1991):27-50.

S. Zabarnick, "A Comparison of CH₄/NO/O₂ and CH₄/N₂O Flames by LIF Diagnostics and Chemical Kinetic Modeling," *Combustion Science and Technology* 83(1992):115-134.

M.R. Zachariah and R.G. Joklik, "Multiphoton Ionization Spectroscopy Measurements of Silicon Atoms During Vapor-Phase Synthesis of Ceramic Particles," *Journal of Applied Physics* 68(1990):311-317.

M.R. Zachariah and D.R.F. Burgess, Jr., "Strategies for Laser Excited Fluorescence Spectroscopy. Measurements of Gas Phase Species During Particle Formation," *Journal of Aerosol Science* 25(1994):487-497.