

HARVARD UNIVERSITY

Department of Chemistry  
12 Oxford Street  
Cambridge, Massachusetts 02138

May 1, 1968

Dear Contributor:

This is the eleventh microwave spectroscopy information letter and is being sent to those who contributed:

1. UNIVERSITY OF BOLOGNA  
Istituto Chimico "G. Ciamician"  
P.G. Favero

$CF_2O$	Carbonyl fluoride		Centrifugal distortion analysis and millimeter wave spectrum, in progress.
$C_2H_3F_2Cl$ ( $CH_3CF_2Cl$ )	1,1-difluoro, 1-chloroethane		Spectrum of the normal species assigned.
$ClNO_2$	Nitryl chloride		Abandoned for the time being.
$FNO_2$	Nitryl fluoride		Paper submitted for publication.
$H_2Se$ ( $D_2Se$ )	Deuterium selenide		Measurements of the millimetric spectrum, in progress.

2. UNIVERSITY OF BRISTOL  
Department of Physical Chemistry  
A. Peter Cox

$CH_3NO_3$	Methyl nitrate	S. Waring	Carbon-13 and nitrogen-15 assigned.
$C_4H_9NOSi$ [ $(CH_3)_3SiNCO$ ]	Trimethyl silicon isocyanate	Miss H.M. Carratt	Molecules assigned.
$C_4H_9NSSi$ [ $(CH_3)_3SiNCS$ ]	Trimethyl silicon isothiocyanate	C.C. Young	Molecules assigned.
$C_5H_5NNiO$ [ $C_5H_5NiNO$ ]	Cyclopentadienyl nitrosyl nickel	A.H. Brittain	Structure complete. Dipole moment and excited states in progress.
$C_5H_5NOPt$ [ $C_5H_5PtNO$ ]	Cyclopentadienyl nitrosyl platinum	C. Roberts	Assigned.
$HNO_2$	Nitrous acid	A.H. Brittain	Cis isomer assigned. Bo isomers near completion.

$N_2O_3$	Dinitrogen trioxide	A.H. Brittain (see R.L. Kuczkowski)	Oxygen-18 species assigned structure nearly complete. Dipole and quadrupole coupling constants deter- mined.
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3. UNIVERSITY OF CALIFORNIA, SANTA BARBARA  
Chemistry Department  
D.O. Harris

$C_3H_6O_2$	Dioxolane		In progress.
$C_3H_6Se$	Selenetane		Ground state assigned and branch assigned.
$C_4H_6O$	3-methylene oxetane		Partially assigned.

4. UNIVERSITY OF COPENHAGEN  
Department of Chemical Physics  
Børge Bak and Lise Nygaard

$C_2H_2N_2O$	1,3,4-oxadiazole		Manuscript in preparation.
$C_2H_2N_2S$	1,3,4-thiadiazole		Quadrupole coupling, centrifugal distortion of parent.
$C_2H_3N_3$	1,2,3-triazole		One tautomer assigned.
$C_3H_3NS$	Thiazole		2- <sup>13</sup> C- and 4-D-species assigned.
$C_3H_4N_2$	Pyrazole		1-D-species assigned.
$C_4H_5N$	Pyrrole		Manuscript in preparation.
$C_4H_6$	Cyclobutene		Two D-species assigned.
$C_5H_5N$	Pyridine		Manuscript in preparation
$C_6H_5F$	Fluorobenzene		Manuscript in preparation
$C_6H_6O$	Phenol		Six mono-D-species assigned. Dipole moment.

5. UNIVERSITY OF FREIBURG  
Physikalisches Institut  
H.D. Rudolph and H. Dreizler

$C_2H_3NS$ ( $CH_3SCN$ )	Methyl-thiocyanate	H. Dreizler	Torsion-vibration excited spectra and interaction, potential barrier, quadrupole cplg. constants.
$C_2H_3NS$ ( $CH_2DSCN$ )	$d_1$ -methyl-thiocyanate	H. Schleser	2 spectra assigned, further isotopic species in preparation.
$C_2H_3NS$ ( $CD_3SCN$ )	$d_3$ -methyl-thiocyanate	H. Heimbürger	Spectrum assigned, dipole moment, quadrupole cplg. constants.
$C_2H_4O_2$ ( $HCOOCH_3$ )	Methyl formate	G. Mueller	Torsional excited states.
$C_2H_6S_2$ [ $(CH_3)_2S_2$ ]	Dimethyl disulfide	D. Sutter	SS-torsion excited states, $CH_2$ -torsion-SS-torsion interaction.
$C_2H_6OS$ [ $(CH_3)_2SO$ ]	Dimethyl-sulfoxide	V. Typke	In press.
$C_4H_6O$ [ $(CH_3)_2CCO$ ]	Dimethyl-ketene	H. Dreizler, I. Rosenbaum, H.D. Rudolph	5 isotopic species spectra barrier potential, further isotopic species in preparation.
$C_5H_7N$ ( $CH_3C_4H_4N$ )	N-methyl-pyrrole	W. Arnold	In press.
$C_5H_7N$ ( $CD_3C_4H_4N$ )	N- $d_3$ -methyl-pyrrole	W. Arnold	In press.
$C_6H_7N$ ( $CH_3C_5H_4N$ )	2-methyl-pyridine	H. Maeder	Spectrum, potential barrier, dipole moment, quadrupole cplg. c.
$C_7H_7F$ ( $CH_3C_6H_4F$ )	Meta-fluorotoluene	A. Trinkaus	In press.
$C_8H_{10}$ [ $(CH_3)_2C_6H_4$ ]	Ortho-xylene	H.D. Rudolph	Spectrum, high-J Q-series, barrier potential, dipole moment.

6. FREIE UNIVERSITÄT BERLIN  
II. Physikalisches Institut  
R. Honerjäger

GeO	Germanium-monoxide	T. Törring	Dipole moment.
GeTe	Germanium-mono-telluride	J. Hoefft and H.P. Nolting	Rotational spectrum ass'd. Z.Naturforsch. <u>22a</u> , 1121 (1967).
OSi	Silicon-monoxide	T. Törring	Rotational spectrum ass'd. To be published.

OSn	Tin-monoxide	T. Törring	Rotational spectrum assigned. Z. Naturforschg 22a, 1234 (1967).
SnTe	Tin-mono-telluride	J. Hoeft and E. Tiemann	Rotational spectrum assigned. To be published.

7. GEORGIA INSTITUTE OF TECHNOLOGY  
School of Physics  
T.L. Weatherly

CHCl <sub>3</sub>	Chloroform	P. Reinhart	Stark Effect. Studies in progress.
CCl <sub>3</sub> F	Trichlorofluoromethane	P. Reinhart	Stark Effect. Studies in progress.
ClOP (POCl)	Phosphoryl chloride	C.R. Nave	Analysis of quadrupole interaction complete. Manuscript in preparation
Cl <sub>2</sub> S (SCl <sub>2</sub> )	Sulfur dichloride	W.A. Little	Second order quadrupole interaction under study.
Cl <sub>3</sub> P (PCl <sub>3</sub> )	Phosphorus trichloride	C.R. Nave	Analysis of quadrupole interaction complete. Manuscript in preparation

8. UNIVERSITY OF GLASGOW  
Department of Chemistry  
J. K. Tyler

C <sub>2</sub> H <sub>3</sub> NO (HOCH <sub>2</sub> CN)	Glycolonitrile	D.G. Lister	Partial analysis of main species.
C <sub>2</sub> H <sub>4</sub> N <sub>2</sub> (NH <sub>2</sub> CH <sub>2</sub> CN)	Aminoacetonitrile	J.N. MacDonald	Normal species analyzed. <sup>14</sup> N quadrupole coupling in progress. Dipole moment
C <sub>3</sub> H <sub>2</sub> O <sub>2</sub>	Propiolic acid	D.G. Lister	Distortion treatment of normal and deuterated forms finished.
C <sub>5</sub> H <sub>4</sub> OS	Pyran-4-thione	Susan Manley	Assigned.
C <sub>5</sub> H <sub>4</sub> OS	Thiapyran-4-one	J.N. MacDonald	Main species complete.
C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>	Pyran-4-one	J.N. MacDonald	Five isotopic species complete. Dipole moment.
C <sub>6</sub> H <sub>4</sub> N <sub>2</sub> S	Piazthiole	D.G. Lister	Moments of inertia for ground vibrational state.
C <sub>6</sub> H <sub>6</sub> FN (FC <sub>6</sub> H <sub>4</sub> NH <sub>2</sub> )	p-fluoroaniline	R.L. MacNeil	Main species assigned.
C <sub>6</sub> H <sub>7</sub> N (C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub> )	Aniline	D.G. Lister	Ring deuterated and 1- <sup>13</sup> C species complete

9. J.W. GOETHE UNIVERSITÄT  
 Institut fuer physikalische Chemie  
 H. Hartmann

$\text{Br}_3\text{HSi}$ ( $\text{SiHBr}_3$ )	Tribromsilane	M. Mitzlaff	Spectrum assigned. Manuscript in press. Structure, dipole moment, centrifugaldistortion effect, vibration interact
$\text{CHBr}_3$	Bromoforme	C. Feige	Quadrupole study.
$\text{CH}_3\text{Cl}_3\text{Si}$	Methyltrichlorsilane	R. Holm	Spectrum assigned, dipole moment, internal rotation, structure, manuscript in press.
$\text{CH}_3\text{HgI}$	Methylmercuryiodide	C. Feige	Manuscript in press.
$\text{CH}_4\text{O}$ ( $\text{CH}_3\text{OH}$ )	Methanol	W. Winkle	Rot. Spectra by excited vibration, in progress.
$\text{C}_2\text{H}_3\text{Cl}_3$ ( $\text{CH}_3\text{CCl}_3$ )	Methylchloroforme	R. Holm	Spectrum assigned, dipole moment, internal rotation, structure, manuscript in press.
$\text{C}_4\text{H}_9\text{I}$ [ $(\text{CH}_3)_3\text{CI}$ ]	t-butyl iodide	W. Winkle	Spectrum assigned. Manuscript in progress.
$\text{Cl}_3\text{FSi}$	Trichlorfluorsilane	M. Mitzlaff	Spectrum assigned. Manu- script in press. Structure, dipole moment, centrifugal distortion effect, vibra- tion interaction.
$\text{Cl}_3\text{HSi}$	Trichlorsilane	M. Mitzlaff	Spectrum assigned. Manu- script in press. Structure dipole moment, centrifugal distortion effect, vibra- tion interaction.
$\text{Cl}_5\text{Mo}$	Molybdenum pentachloride	C. Feige	Rot. spectra by excited vibration.

10. HARVARD UNIVERSITY  
 Chemistry Department  
 E. B. Wilson, Jr.

$\text{CH}_4\text{Se}$ ( $\text{CH}_3\text{SeH}$ )	Methyl selenol	C. Thomas	Writing up.
$\text{C}_2\text{H}_3\text{ClF}_2$ ( $\text{CH}_3\text{CF}_2\text{Cl}$ )	Difluorochloroethane	G. Graner and C. Thomas	Written up.
$\text{C}_2\text{H}_5\text{BrO}$ ( $\text{CH}_2\text{BrCH}_2\text{OH}$ )	Ethylene bromhydrin	R. Azrak	Main species assigned.

$C_2H_5ClO$ ( $CH_2ClCH_2OH$ )	Ethylene chlorhydrin	R. Azrak	Main species assigned.
$C_2H_5FO$ ( $CH_2FCH_2OH$ )	Ethylene fluorhydrin	R. Azrak	Main species assigned.
$C_3H_5FO$ ( $CH_3CH_2CFO$ )	Propionyl fluoride	O. Stiefvater	Writing up
$C_3H_6O_2$ ( $CH_3CH_2COOH$ )	Propionic acid	O. Stiefvater	Ground plus some excited states.

11. UNIVERSITY OF ILLINOIS  
Department of Chemistry and Chemical Engineering  
W.H. Flygare

$C_2ClF_3$	1,1-difluoro, 2-fluoro 2-chloro-ethylene		In progress.
$C_2HClF_2$	1,1-difluoro-2-chloroethylene		"
$C_2H_3F_2N$	N-methyl-difluoromethylenimine		"
$C_2H_4S$ ( $\underline{CH_2-CH_2-S}$ )	Ethylene sulfide		"
$C_2H_5N$ ( $\underline{CH_2-CH_2-NH}$ )	Ethylene imine		"
$C_2H_6O_2$	Dimethyl peroxide		"
$C_3H_2O$	Cyclopropenone		"
$C_3H_4ClF$	cis-1-chloro-2-fluoropropene		"
$C_3H_4O$	Cyclopropanone		"
$C_4H_6$	Methylenecyclopropane		"
$C_4H_6$	Methylcyclopropene		"
$C_4H_6O$	Methylcyclopropenone		"
$C_5H_8$	Isoprene		"
$C_5H_8$	Methylcyclobutene		"
$C_5H_8O$	Dimethylcyclopropenone		"

12. UNIVERSITY OF KANSAS  
Chemistry Department  
M.D. Harmony

$C_3H_5N$ ( $C_2H_5CN$ )	Propionitrile	Li	Quadrupole coupling constant analysis.
$C_3H_7N$ ( $C_3H_5NH_2$ )	Cyclopropylamine	Hendricksen	$-ND_2$ species assigned.
$C_3H_7N$	Propyleneimine	Li, Harmony	Trans species completed; cis species still being investigated.

$C_4H_6$	Bicyclobutane	Cox	Normal species and two $C^{13}$ species finished; D species underway.
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13. LOUISIANA STATE UNIVERSITY  
Physics Department  
E.L. Beeson, Jr.

$C_3H_7N$ ( $CH_3 \cdot CH \cdot CH_2 \cdot NH$ )	Propyleneimine or 2-methyl-aziridine	R. Schmidt, E.L. Beeson	Studying internal rotation and hyperfine splitting of <u>cis</u> isomer
$CCl_2F_2$	Dichlorodifluoromethane	Shu-ming Hu, E.L. Beeson	Analyzing nuclear quadrupole splitting.

14. UNIVERSITY OF LOUVAIN  
Centre de Physique Nucléaire  
M. de Hemptinne

$C_2H_6O$ ( $CD_3CD_2OH$ )	Ethyl alcohol	Culot	New lines assigned.
$C_2H_6O$ ( $CD_3CD_2OD$ )	Ethyl alcohol	Culot	New lines assigned.
$O_2S$ ( $S_{33}O_{17}O_{17}$ )	Sulfur dioxide	Van Riet	Spectrum assigned.

15. UNIVERSITY OF MANCHESTER  
Atomic and Molecular Physics Group  
J.G. Baker

$C_2H_3F_3$ ( $CH_3CF_3$ )	1,1,1-trifluoroethane	Barbara Heys	Barrier from intensity measurements.
$C_2F_3N$ ( $CF_3CN$ )	Trifluoroacetonitrile	M.J. Whittle	Excited bending states resolved and assigned.
$C_2H_3N$ ( $CH_3CN$ )	Acetonitrile	M.J. Whittle	Re-examination of excited bending spectrum
$C_7H_8O$ ( $C_6H_5OCH_3$ )	Anisole	J.G. Baker	Work ceased.
$C_{12}H_{10}O$ ( $(C_6H_5)_2O$ )	Diphenyl ether	J.G. Baker	Work continuing.
$F_3OP$	Phosphorus oxyfluoride	M.J. Whittle	Assignment of excited bend in progress.

16. UNIVERSITY OF MARYLAND  
Institute for Molecular Physics  
L.C. Krisher

$C_2H_5NO$ ( $C_2H_2D_3NO$ )	Acetamide	L.C. Krisher E.I. Saegbarth	Not assigned.
$C_3H_5ClO$ ( $CH_2ClCOCH_3$ )	Chloroacetone	E.I. Saegbarth	Spectrum measured.

$C_3H_5FO$	Fluoroacetone	E.I. Saegebarth	Manuscript in preparation.
$C_4H_2O_3$	Maleic anhydride	L.C. Krisher (with J. Sheridan at Bangor, N. Wales)	Assigned. Manuscript in preparation.
$C_5H_6O$	2-methylfuran	W.G. Norris L.C. Krisher	In progress.

17. MCDONNELL DOUGLAS CORPORATION  
Research Division  
J.E. Wollrab

$C_2H_3ClN_2 [Cl(CH_3)CN_2]$	Chloromethyldiazirine	In coop. with J. Merritt, US Army Missile Command	$Cl^{35}$ spectrum assigned. $Cl^{35}$ quadrupole constants determined.
$C_2H_4N_2 [CH_3HCN_2]$	Methyldiazirine	"	Ground state spectrum assigned. Barrier to internal rotation calculated. Partially resolved quadrupole structure analyzed.
$C_3H_6N_2 [(CH_3)_2CN_2]$	Dimethyldiazirine	"	Ground state spectrum assigned. Barrier to internal rotation calculated. Partially resolved quadrupole structure analyzed.
$C_6H_{10}$	Cyclohexene		Spectra of $C_6H_{10}$ , $C_6D_{10}$ and 3,3,6,6 cyclohexene- $d_4$ assigned. Dipole moments determined. Completed.

18. UNIVERSITY OF MICHIGAN  
Chemistry Department  
R. Kuczkowski

$F_2HP (HPF_2)$	Difluorophosphine	R. Kuczkowski	In press.
$F_2HOP (CF_2PO)$	Hydrophosphoryldifluoride	L. Centofonti	Structure done.
$N_2O_3$	Dinitrogen Trioxide	R. Kuczkowski	Vibrational satellites assigned.



19. MICHIGAN STATE UNIVERSITY  
Department of Chemistry  
R. H. Schwendeman

$C_2H_5NO$ ( $CH_3CHNOH$ )	Acetaldoxime	R.S. Rogowski	Manuscript prepared.
$C_4H_5FO$ ( $CH_2CH_2CHCOF$ )	Cyclopropylcarboxylic acid fluoride	H.N. Volltrauer	Nearly completed.
$C_4H_6O$ ( $CH_2CH_2CHCHO$ )	Cyclopropylcarboxaldehyde	H.N. Volltrauer	Nearly completed.
$C_5H_8$ ( $CH_2CH_2CHCHCH_2$ )	Vinylcyclopropane	E.G. Coddling	Trans species assigned.

20. MONASH UNIVERSITY  
Chemistry Department  
R.D. Brown and F.R. Burden

$C_2FeN_2O_4$ ( $Fe(CO)_2(NO)_2$ )	Iron carbonyl nitrosyl	F.R. Burden	Some lines measured.
$C_2H_2N_2Se$	Selenadiazole	G. Blackman	Paper published; work in progress on deuterio species.
$C_4H_4Se$	Selenophene	P.D. Godfrey	Paper published; work in progress on deuterio species; $\alpha$ -deuterio species assigned.
$C_6H_6$	Dimethylenecyclobutene	J. Kent	Paper published; work in progress on deuterio species.
$C_6H_6$	Fulvene	J. Kent	Work continuing.
$C_9H_7N$	Quinoline	G.R. Williams	Some lines measured.
$CrF_4$	Chromium tetrafluoride	P. Burton	Work commenced
$F_2OSe$ ( $SeOF_2$ )	Selenium oxyfluoride	I.C. Bowater	Measurements on $^{18}O$ species completed; manuscript in preparation
$F_4Se$ ( $SeF_4$ )	Selenium tetrafluoride	I.C. Bowater	Assigned; dipole moment measured; manuscript in preparation.

21. NATIONAL BUREAU OF STANDARDS  
Infrared and Microwave Spectroscopy Section  
D.R. Lide and W.H. Kirchhoff

CFN (FCN)	Cyanogen fluoride	W.J. Lafferty	Vibrational states being studied.
CF <sub>2</sub>	Carbondifluoride	F.X. Powell and W.H. Kirchhoff	Entire spectrum accounted for. Distortion effects being studied

CHN (HCN)	Hydrogen Cyanide	A. Maki	Rotational spectra in excited vibrational states.
$C_3H_8Si$	Silacyclobutane	W. Pringle	Manuscript in prepar
$C_4H_6S$	Dihydrothiophene	J. Greenhouse	Tentative assignment of ground state.
$ClF_4P$	Phosphorous chloride tetrafluoride	M.K. Wilson	Tentative assignment new sample being prepared.
$ClF_5$	Chlorine pentafluoride	W.H. Kirchhoff	Manuscript in prepar
ClO	Chlorine monoxide	D. Johnson, F.X. Powell	Dipole Moment $^2\Pi_{1/2}$ state assigned for $Cl_{35}$ and $Cl_{37}$ specie
$F_6OSi_2 (SiF_3OSiF_3)$	Perfluorodisiloxane	M.K. Wilson, W.H. Kirchhoff	No spectrum observed abandoned.
HNOS	Thionylimide	W.H. Kirchhoff	Manuscript in prepar

22. NATIONAL RESEARCH COUNCIL OF CANADA  
Division of Pure Physics  
C.C. Costain

$CH_4O (CH_3OH)$	Methyl alcohol	R. Lees	Paper accepted.
$C_3N_2O (CO(CN)_2)$	Carbonyl Cyanide	R. Lees	Spectrum assigned.
$C_5H_{11}N$	Piperidine	J.E. Parkin, P.J. Buckley	Chair-axial and chair-equatorial forms assigned.

23. UNIVERSITY OF NEW BRUNSWICK  
Physics Department  
K.V.L.N. Sastry

$C_3H_6S (CH_2=CHCH_2SH)$	Allyl Mercaptan	S.C. Dass, K.V.L.N. Sastry	Manuscript prepared.
$C_4H_5N (CH_2=CHCH_2CN)$	Allyl cyanide	K.V.L.N. Sastry, V.M. Rao, S.C. Dass	Manuscript accepted for publication.
$C_4H_8O (C_3H_5CH_2OH)$	Cyclopropyl carbinol	K.V.L.N. Sastry, W.V.F. Brooks	Spectrum assigned.

24. STATE UNIVERSITY OF NEW YORK AT BUFFALO  
Physics Department  
T.N. Sarachman

$C_3H_7Br$	Normal propyl bromide	A.E. Nowak	Trans form assigned.
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25. UNIVERSITY COLLEGE OF NORTH WALES, BANGOR  
 Department of Chemistry  
 J. Sheridan

$C_2HBr$	bromo acetylene	H. Jones	Work continuing on isotopic species.
$C_2H_2N_2O$	2,4 oxadiazole	Valerie Williams	Preliminary results published, work contin.
$C_2H_3FO_2$	Methyl fluoroformate	G. Williams	Preliminary results of barriers published; work continuing.
$C_3H_3N$	Vinyl isocyanide	K. Bolton	Assigned.
$C_3H_3NO$	Oxazole	A. Wardley	Preliminary results published; work continuing - nuclear quadrupole constants.
$C_3H_3NO$	Isoxazole	A. Wardley	Preliminary results published; work continuing - nuclear quadrupole constants.
$C_3H_3NO_2$	Methyl cyanoformate	G. Williams	Preliminary results of barriers published; work continuing.
$C_3H_3NS$	Isothiazole	A. Wardley	Preliminary results published; work continuing - nuclear quadrupole constants.
$C_3H_3NSe$	Isoselenazole		
$C_3H_4N_2$	Imidazole	J. Griffiths	Preliminary results of main and N-deutero species published; work continuing.
$C_3H_4O$	Propargyl alcohol	K. Bolton	Preliminary results published; work contin.
$C_3H_4O_2$	Acrylic acid	K. Bolton	<u>cis and trans</u> forms assigned, dipole, vibrational satellites assigned; preliminary results in press.
$C_3H_5N$	Ethyl isocyanide	K. Bolton	Preliminary results published; work contin.
$C_3H_5N$	Propargyl amine	K. Bolton	Preliminary results published; work contin.

$C_3H_6O$	Cyclopropanol	J. Marks	Tentative assignment.
$C_3H_6O_2$	Methyl acetate	G. Williams	Preliminary results published; work continuing on barrier and deuterated species.
$C_3H_6O_3$	Dimethyl carbonate	N.L. Owen	Analysis in progress
$C_3H_7F$	Isopropyl fluoride	J. Griffiths	Barrier, dipole, vibrational satellites assigned
$C_4H_2O_3$	Maleic anhydride	Valerie Williams	Preliminary results reported; work continuing
$C_4H_4O_2$	Methyl propiolate	G. Williams	Preliminary results of barriers published; work continuing.
$C_4H_5N$	Allyl cyanide	C.R. Nave	Work suspended for present
$C_4H_6O_2$	Methyl acrylate	G. Williams	<u>cis</u> rotamer assigned.
$C_4H_7N$	3-pyrroline	C.R. Nave	To be continued by Dr. Nave at Georgia State College, Atlanta.
$C_4H_8O$	Isobutyryl aldehyde	O.L. Stiefvater	Ground state assigned; several vibrational states observed.
$C_4H_8O$	Ethyl vinyl ether	N.L. Owen	Dipole, vibrational states assigned.
$C_5H_8O$	2,3 dihydropyran	Valerie Williams	Assigned.
$C_7H_7FO$	p-fluoroanisole	N.L. Owen	Analysis in progress.
$F_2HPS$	Hydrothiophosphoryl difluoride	C.R. Nave	Structure determined; manuscript in preparation

26. UNIVERSITY OF OSLO  
 Department of Chemistry  
 K.M. Marstokk and H. Møllendahl

$C_4HCl$ (HCCCCl)	Monochlorodiacetylene	A. Bjørseth	Spectrum assigned.
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27. UNIVERSIDAD NACIONAL DE LA PLATA  
 Department of Physics  
 L.M. Boggia and O. Sorarrain

$C_4H_8S_2$ [ $S(CH_2)_2S(CH_2)_2$ ]	p-dithiane	R. Veronesi and M. Gomez	Search in progress.
$C_4H_9NO$ [ $NH(CH_2)_2O(CH_2)_2$ ]	Morpholine	O. Sorarrain, M. Gomez	Search in progress.

$C_4H_9NS$	Thiomorpholine	R. Veronesi and O. Villani	Search in progress.
$C_{10}H_8$	Azulene	L.M. Boggia and M. Gomez	Spectrum measured in not previously invest. zone.

28. THE PENNSYLVANIA STATE UNIVERSITY  
Chemistry Department  
L.P. Gold

$C_3H_6O_2S$ ( $CH_3SO_2CHCH_2$ )	Methyl vinyl sulfone	W. Krugh and D. Levine	Spectrum measured.
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29. RICE UNIVERSITY  
Chemistry Department  
R.R. Curl

$C_3H_3FO$	Acryloyl fluoride	J. Keirns	Paper in press.
OPb	Lead oxide	A.N. Murty	Dipole moment measured.
SSn	Stannous sulfide	A.N. Murty	Dipole moment measured.

30. SAHA INSTITUTE OF NUCLEAR PHYSICS  
Microwave Spectroscopy Department  
D.K. Ghosh

$C_2H_4OS$ ( $CH_3COSH$ )	Thioacetic acid	D.K. Ghosh, A. Chatterjee	Spectrum recorded. Assignments of transition and rough estimate of barrier made.
$C_2H_7N$ ( $C_2H_5NH_2$ )	Ethylamine	A.K. Saha, D.K. Ghosh, A. Chatterjee	Work in progress. No con- clusion still arrived at
$C_3H_6S$ ( $CH_2:CHCH_2SH$ )	Allyl Mercaptan	A. Chatterjee, R. Nandy	Spectrum has been observed. Tentative assignment made.

31. UNIVERSITY OF SOUTHERN CALIFORNIA  
Department of Chemistry  
R.A. Beaudet

$CH_{11}B_5$ ( $CH_3B_5H_8$ )	1-methylpentaborane	E.A. Cohen, R.A. Beaudet	Accepted J.C.P.
$C_2H_5P$ ( $CH_2CH_2PH$ )	Phosphiran	M.R. Bowers, R.A. Beaudet	Submitted J.A.C.S.
$C_2H_6BF$ [ $(CH_3)_2BF$ ]	Dimethyl boron fluoride	S. Cheung	Doing $(CD_3)_2BF$ .

$C_2H_6B_4$	2,3 dicarbahehexaborane (6)	R.L. Poynter, R.A. Beaudet	$C^{13}$ isotope left
$C_2H_{11}B_2N$ [(CH <sub>3</sub> ) <sub>2</sub> NB <sub>2</sub> H <sub>5</sub> ]	Dimethylamino diborane	E.A. Cohen	Draft stage.
$C_3H_3N$ (CH <sub>2</sub> =CHNC)	Vinyl isocyanide	W.C. Cummings	Assigned and structure.
$C_3H_5Br$ (CH <sub>3</sub> CH=CHBr)	<u>cis</u> bromopropene	R.A. Beaudet	Draft stage.
$C_3H_5Br$ (trans-CH <sub>3</sub> CH=CHBr)	<u>trans</u> bromopropene	R.A. Beaudet	Accepted J.C.P.
$C_3H_6F_2$ [(CH <sub>3</sub> ) <sub>2</sub> CF <sub>2</sub> ]	2,2-difluoropropane	R.A. Beaudet, R.L. Poynter	Vibrational states.
$C_3H_6F_2Si$ (CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> SiF <sub>2</sub> )	Difluoro sila cyclobutane	R.G. Ford	Four vibrational states assigned.
$C_3H_8B_3$ (CH <sub>3</sub> ·B <sub>3</sub> C <sub>2</sub> H <sub>5</sub> )	2 methyl-1,5-dicarbapentaborane (5)	L. Wang	Partially assigned.
$C_4H_6F_2$ (CH <sub>3</sub> CHCF <sub>2</sub> CH <sub>2</sub> )	2,2 difluoro-1-methyl-cyclopropane	R.G. Ford and R.A. Beaudet	Accepted J.C.P.
$C_4H_6O$ (CH <sub>2</sub> =CHCHCH <sub>2</sub> O)	butadiene monoxide	W.C. Cummings	Assigned.
$C_4H_8O$ [(CH <sub>3</sub> ) <sub>2</sub> CCH <sub>2</sub> O]	1,1-dimethylethylene oxide	W.C. Cummings	Assigned.
$C_4H_9$ (CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> )	Methylcyclopropane	R.G. Ford and R.A. Beaudet	Accepted J.C.P.
$C_5H_6F_2$ [CF <sub>2</sub> =CHC(CH <sub>3</sub> )=CH <sub>2</sub> ]	Methyl-1,1,difluorobutadiene	T.S. Huang	Draft stage
$C_5H_6F_2$ [CF <sub>2</sub> =C(CH <sub>3</sub> )CH=CH <sub>2</sub> ]	2methyl-1,1-difluorobutadiene	W.S. Cummings	Draft stage
$C_5H_8$ [CH=C(CH <sub>3</sub> )CH <sub>2</sub> CH <sub>2</sub> ]	1-methylcyclobutene (1)	T.S. Huang and R.A. Beaudet	Vibrational states.

32. SWISS FEDERAL INSTITUTE OF TECHNOLOGY  
Laboratory of Physical Chemistry  
Hs.H. Günthard

$C_2H_5NO_2$ (CH <sub>3</sub> CH <sub>2</sub> NO <sub>2</sub> )	Nitroethane	E. Mathier	Spectrum measured.
$C_3H_5I$ (CH <sub>2</sub> :CICH <sub>3</sub> )	2-Iodopropene	A. Bauder	Rotational and quadrupole constants for the ground state.
Cl <sub>2</sub> OS	Thionyl chloride	H.U. Wenger	Tentatively assigned.

33. UNIVERSITY OF TEXAS  
Department of Chemistry  
J.E. Boggs

CH <sub>3</sub> P (CH <sub>3</sub> PH <sub>2</sub> )	Methylphosphine	Rebecca Young	Spectrum of deuterated species assigned.
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34. TOKYO INSTITUTE OF TECHNOLOGY  
Laboratory of Chemical Spectroscopy  
K. Kozima

$C_3H_4O_2$	Acrylic acid	M. Suzuki	Work in progress.
$C_4H_4$	Vinyl acetylene	C. Hirose	Centrifugal distortion and excited vib. states work almost completed.
$C_4H_4$ ( $C_4H_3D$ )	Vinyl acetylene-d	C. Hirose	Ground state assigned, vib.-rot. interaction, work in progress.
$C_6H_4F_2$	o-difluorobenzene	A. Hatta and C. Hirose	In press (Bull. Chem. Soc. Japan).
$C_6H_{10}$	Cyclohexene	T. Ogata	Spectrum assigned, manuscript prepared.
$C_6H_{10}O$	Cyclohexanone	Y. Ohnishi	In press (Bull. Chem. Soc. Japan).

35. UNIVERSITY OF TOKYO  
Department of Chemistry  
Y. Morino

$CH_2F_2$ ( $CD_2F_2$ )	Methylene fluoride	K. Sakakibara	Centrifugal distortion; work completed.
$CH_5N$ [ $CH_4DN$ ( $CH_2DNH_2$ )]	Deuterated methyl amine	K. Tamagake	Trans rotamer assigned.
$C_2H_4OS$ [ $(CH_2)_2SO$ ]	Ethylene episulfoxide	S. Saito	r <sub>0</sub> structure, manuscript prepared.
$C_3H_4O$	Propargyl alcohol	E. Hirota	Internal rotation, in press (J. Mol. Spectry)
$C_3H_5Cl$	Allyl chloride	E. Hirota	Rotational isomerism in cis and skew forms, work almost completed.
$C_3H_6$ ( $CH_2DCH=CH_2$ )	Deuterated propylene	E. Hirota, T. Hirooka	Internal rotation, in press (J. Mol. Spectry)
$C_4H_8$	Butene-1	S. Kondo and E. Hirota	Rotational isomerism in cis and skew forms; manuscript prepared.
$C_4H_8$	Butene-2 (and deuterated species)	S. Kondo	Internal rotation, work almost completed.
$C_5H_8$ ( $CH_2=CHCH_2CH=CH_2$ )	1,4-Pentadiene	E. Hirota	One rotamer assigned.

$\text{ClO}$ ( ${}^2\Pi_{1/2}$ )	Chlorine monoxide	T. Amano	Manuscript in press (J. Mol. Spectry).
$\text{FNO}_2$	Nitryl fluoride	T. Tanaka	Centrifugal distortion and Coriolis interaction work completed.
$\text{F}_3\text{N}$ ( $\text{NF}_3$ )	Nitrogen trifluoride	M. Otake	Vib-rot interaction and $r_e$ structure, manuscript prepared.
$\text{F}_3\text{P}$ ( $\text{PF}_3$ )	Phosphorous trifluoride	M. Otake	Vib-rot interaction, work almost completed.
$\text{O}_2$	Oxygen	T. Amano	Excited vibrational state, manuscript in preparation.
$\text{O}_2\text{S}$ ( $\text{SO}_2$ )	Sulfur dioxide	S. Saito	Higher excited vib. states, manuscript submitted to J.Mol.Spectry
$\text{O}_2\text{Se}$ ( $\text{SeO}_2$ )	Selenium	H. Takeo	Vib-rot interaction and $r_e$ structure, work completed.
$\text{O}_3$	Ozone	T. Tanaka	Vib-rot interaction and $r_e$ structure, work completed.

36. TOYAMA UNIVERSITY  
Department of Physics  
T. Kojima

$\text{CH}_5\text{N}$ ( $\text{CH}_3\text{NH}_2$ )	Methyl amine	T. Takagi and T. Kojima	Manuscript in preparat.
$\text{CH}_5\text{N}$ ( $\text{CH}_3\text{NHD}$ )	Methyl amine	K. Takagi and T. Kojima	Manuscript in preparat.
$\text{CH}_5\text{N}$ ( $\text{CH}_3\text{ND}_2$ )	Methyl amine	K. Takagi and T. Kojima	Manuscript in preparat.
$\text{C}_2\text{H}_4\text{OS}$ ( $\text{CH}_3\text{COSH}$ )	Thio-acetic acid	S.Nakagawa	Nearly complete.

37. UNIVERSITY OF ULM  
Lehrstuhl für Physikalische Chemie  
W. Zeil

$\text{CH}_5\text{ClSi}$ ( $\text{CH}_3\text{SiClH}_2$ )	Methylsiliconchlorid	R. Ronchi and W. Zeil	Spectrum measured and some lines assigned.
$\text{C}_5\text{H}_9\text{ClSi}$ [ $(\text{CH}_3)_3\text{Si-C}\equiv\text{C-Cl}$ ]	Trimethylsiliconchloroacetylen	R. Gegenheimer, W. Zeil	Some isotopic species assigned.



38. UNIVERSITY COLLEGE, LONDON  
Chemistry Department  
D.J. Millen

$\left. \begin{array}{l} C_{10}H_{15}F \\ C_{10}H_{15}Cl \\ C_{10}H_{15}Br \end{array} \right\}$	Haloadamantanes	D. Chadwik and A.C. Legon	Structure determined, paper accepted.
$FNO_2$	Nitryl fluoride	A.C. Legon	Isotopic substitution. Structure determined. Paper submitted.

39. UNIVERSITY OF WISCONSIN  
Chemistry Department  
C.D. Cornwell

$B_2BrH_5$ ( $B_2H_5Br$ )	Bromodiborane	A.C. Ferguson	Isotopic measurements in progress.
$CF_7P$ ( $CF_3PF_4$ )	Trifluoromethyl tetra- fluoro phosphorane	E.A. Cohen	Preliminary note accepted Further work continuing.
$F_4HP$ ( $HPF_4$ )	Monofluorophosphorane	S.B. Pierce	Manuscript accepted. Further work continuing.

40. NETHERLAND STATE UNIVERSITY, UTRECHT  
Physical Laboratory  
G. Ruitenber

$CH_6Si$ ( $CH_3SiH_3$ )	Methylsilane	G. Ruitenber	Intensity measurements.
$C_2H_3FO_2$ ( $CH_2F-COOH$ )	Fluoroacetic acid	B.P. van Eijck	Spectrum assigned.
$C_3H_4O$ ( $H_3C \cdot O - C \equiv CH$ )	Methoxy ethyne	G. Ruitenber	Intensity measurements.

FORMULA INDEX

(Arrangement as in Townes and Schawlow  
Numbers refer to Institutions)

- $B_2BrH_5$  ( $B_2H_5Br$ ) bromodiborane - 39  
 $Br_3HSi$  tribromsilane - 9  
 $CCl_2F_2$  dichlorodifluoromethane - 13  
 $CCl_3F$  trichlorofluoromethane - 7  
 $CFN$  (FCN) cyanogen fluoride - 21  
 $CF_2$  carbondifluoride - 21  
 $CF_2O$  carbonyl fluoride - 1  
 $CF_7P$  ( $CF_3PF_4$ ) trifluoromethyl tetrafluoro phosphorane - 39  
 $CHBr_3$  bromoform - 9  
 $CHCl_3$  chloroform - 7  
 $CHN$  (HCN) hydrogen cyanide - 21  
 $CH_2F_2$  ( $CH_2F_2$ ,  $CD_2F_2$ ) methylene fluoride - 35  
 $CH_3Cl_3Si$  methyltrichlorsilane - 9  
 $CH_3HgI$  methylmercuriodide - 9  
 $CH_3NO_3$  methyl nitrate - 2  
 $CH_4O$  ( $CH_3OH$ ) methanol - 9  
 $CH_4O$  ( $CH_3OH$ ) methyl alcohol - 22  
 $CH_4Se$  ( $CH_3SeH$ ) methyl selenol - 10  
 $CH_5ClSi$  ( $CH_3SiClH_2$ ) methylsiliconchloride - 37  
 $CH_5N$  ( $CH_3NH_2$ ) methyl amine - 36  
 $CH_5N$  ( $CH_4DN(CH_3NHD)$ ) methyl amine - 36  
 $CH_5N$  ( $CH_3ND_2$ ) methyl amine - 36  
 $CH_5N$  ( $CH_4DN(CH_2DNH_2)$ ) deuterated methyl amine - 35  
 $CH_5P$  ( $CH_3PH_2$ ) methyl phosphine - 33  
 $CH_{11}B_5$  ( $CH_3B_5H_8$ ) 1-methylpentaborane - 31  
 $C_2ClF_3$  1,1-difluoro, 2-fluoro 2-chloroethylene - 11  
 $C_2FeN_2O_4$  ( $Fe(CO)_2(NO)_2$ ) iron carbonyl nitrosyl - 20  
 $C_2F_3N$  ( $CF_3CN$ ) trifluoroacetonitrile - 15  
 $C_2HBr$  bromo acetylene - 25  
 $C_2HClF_2$  1,1-difluoro-2-chloroethylene - 11  
 $C_2H_2N_2O$  1,3,4-oxadiazole - 4  
 $C_2H_2N_2O$  2,4 oxadiazole - 25  
 $C_2H_2N_2S$  1,3,4-thiadiazole - 4  
 $C_2H_2N_2Se$  selenadiazole - 20  
 $C_2H_3ClF_2$  ( $CH_3CF_2Cl$ ) difluorochloroethane - 10 - 1  
 $C_2H_3ClN_2$  [ $Cl(CH_3)CN_2$ ] chloromethyl-diazirine - 17  
 $C_2H_3Cl_3$  ( $CH_3CCl_3$ ) methylchloroform - 9  
 $C_2H_3FO_2$  methylfluoroformate - 25  
 $C_2H_3F_2N$  N-methyl-difluoromethylenimine - 11  
 $C_2H_3F_3$  ( $CH_3CF_3$ ) 1,1,1-trifluoroethane - 15  
 $C_2H_3N$  ( $CH_3CN$ ) acetonitrile - 15  
 $C_2H_3NO$  ( $HOCH_2CN$ ) glycolonitrile - 8  
 $C_2H_3NS$  ( $CH_3SCN$ ) methylthiocyanate - 5  
 $C_2H_3NS$  ( $CH_2DSCN$ )  $d_1$ -methyl-thiocyanate - 5  
 $C_2H_3NS$  ( $CD_3SCN$ )  $d_3$ -methyl-thiocyanate -  
 $C_2H_3N_3$  1,2,3-triazole - 4  
 $C_2H_4N_2$  ( $NH_2CH_2CN$ ) aminoacetonitrile - 8

- $C_2H_4N_2$  [ $CH_2HCN_2$ ] methyldiazirine - 17  
 $C_2H_4OS$  ( $(CH_2)_2SO$ ) ethylene episulfoxide - 35  
 $C_2H_4OS$  ( $CH_3COSH$ ) thio-acetic acid - 36  
 $C_2H_4OS$  ( $CH_3COSH$ ) thioacetic acid - 30  
 $C_2H_4O_2$  ( $HCOOCH_3$ ) methyl formate - 5  
 $C_2H_4S$  ( $CH_2-CH_2-S$ ) ethylene sulfide - 11  
 $C_2H_5BrO$  ( $CH_2BrCH_2OH$ ) ethylene bromhydrin - 10  
 $C_2H_5ClO$  ( $CH_2ClCH_2OH$ ) ethylene chlorhydrin - 10  
 $C_2H_5FO$  ( $CH_2FCH_2OH$ ) ethylene fluorhydrin - 10  
 $C_2H_5N$  ( $CH_2-CH_2-NH$ ) ethylene imine - 11  
 $C_2H_5NO$  ( $CH_3CHNOH$ ) acetaldoxime - 19  
 $C_2H_5NO$  ( $C_2H_2D_3NO$ ) acetamide - 16  
 $C_2H_5NO_2$  ( $CH_3CH_2NO_2$ ) nitroethane - 32  
 $C_2H_5P$  ( $CH_2CH_2PH$ ) phosphiran - 31  
 $C_2H_6BF$  ( $(CH_3)_2BF$ ) dimethyl boron fluoride - 31  
 $C_2H_6B_4$  2,3 dicarbohexaborane (6) - 31  
 $C_2H_6O$  ( $CD_3CD_2OH$ ) ethyl alcohol - 14  
 $C_2H_6O$  ( $CD_3CD_2OD$ ) ethyl alcohol - 14  
 $C_2H_6OS$  ( $(CH_3)_2SO$ ) dimethyl-sulfoxide - 5  
 $C_2H_6O_2$  dimethyl peroxide - 11  
 $C_2H_6S_2$  ( $(CH_3)_2S_2$ ) dimethyl disulfide - 5  
 $C_2H_7N$  ( $C_2H_5NH_2$ ) ethylamine - 30  
 $C_2H_{11}B_2N$  [ $(CH_3)_2NB_2H_5$ ] dimethylamino diborane - 31  
 $C_3H_2O$  cyclopropenone - 11  
 $C_3H_2O_2$  propiolic acid - 8  
 $C_3H_3FO$  acryloyl fluoride - 29  
 $C_3H_3N$  ( $CH_2=CHNC$ ) vinyl isocyanide - 31  
 $C_3H_3N$  vinyl isocyanide - 25  
 $C_3H_3NO$  oxazole - 25  
 $C_3H_3NO$  isoxazole - 25  
 $C_3H_3NO_2$  methyl cyanofornate - 25  
 $C_3H_3NS$  isothiazole - 25  
 $C_3H_3NS$  thiazole - 4  
 $C_3H_3NSe$  isoselenazole - 25  
 $C_3H_4ClF$  cis-1-chloro-2-fluoropropene - 11  
 $C_3H_4N_2$  imidazole - 25  
 $C_3H_4N_2$  pyrazole - 4  
 $C_3H_4O$  propargyl alcohol - 25  
 $C_3H_4O$  propargyl alcohol - 35  
 $C_3H_4O$  cyclopropanone - 11  
 $C_3H_4O_2$  acrylic acid - 34 - 25  
 $C_3H_5Br$  ( $CH_3CH=CHBr$ ) cis bromopropene - 31  
 $C_3H_5Br$  (trans- $CH_3CH=CHBr$ ) trans bromopropene 31  
 $C_3H_5Cl$  allyl chloride - 35  
 $C_3H_5ClO$  ( $CH_2ClCOCH_3$ ) - chloroacetone - 16  
 $C_3H_5FO$  ( $CH_3CH_2CFO$ ) propionyl fluoride - 10  
 $C_3H_5FO$  fluoroacetone - 16  
 $C_3H_5I$  ( $CH_2:ClCH_3$ ) 2-iodopropene - 32  
 $C_3H_5N$  ( $C_2H_5CN$ ) propionitrile - 12  
 $C_3H_5N$  ethyl isocyanide - 25  
 $C_3H_5N$  propargyl amine - 25  
 $C_3H_6$  ( $CH_2DCH=CH_2$ ) deuterated propylene - 35

- $C_3H_6F_2$   $[(CH_3)_2CF_2]$  2,2-difluoropropane - 31  
 $C_3H_6F_2Si$   $(\underline{CH_2CH_2CH_2}SiF_2)$  difluoro silacyclobutane - 31  
 $C_3H_6N_2$   $[(CH_3)_2CN_2]$  dimethyldiazirine - 17  
 $C_3H_6O$  cyclopropanol - 25  
 $C_3H_6O_2$  methyl acetate - 25  
 $C_3H_6O_2$   $(CH_3CH_2COOH)$  propionic acid - 10  
 $C_3H_6O_2$  dioxotane - 3  
 $C_3H_6O_2S$  methyl vinyl sulfone - 28  
 $C_3H_6O_3$  dimethyl carbonate  
 $C_3H_6S$   $(CH_2:CHCH_2SH)$  allyl mercaptan - 30 - 23  
  
 $C_3H_6Se$  selenetane - 3  
 $C_3H_7Br$  normal propyl bromide - 24  
 $C_3H_7F$  isopropyl fluoride - 25  
 $C_3H_7N$   $(CH_3 \cdot CH \cdot CH_2 \cdot NH)$  2-methyl-aziridine - 13  
 $C_3H_7N$   $(C_3H_5NH_2)$  cyclopropylamine - 12  
 $C_3H_7N$  propyleneimine - 12  
 $C_3H_8B_3$   $(CH_3 \cdot B_3C_2H_5)$  2-methyl-1, 5-dicarbapentaborane (5) - 31  
 $C_3H_8Si$  silacyclobutane - 21  
 $C_3N_2O$   $(CO(CN)_2)$  carbonyl cyanide - 22  
 $C_4HCl$   $(HCCCCl)$  monochlorodiacetylene - 26  
 $C_4H_2O_3$  maleic anhydride - 25 - 16  
  
 $C_4H_4$  vinyl acetylene - 34  
 $C_4H_4$   $(C_4H_3D)$  vinyl acetylene-d - 34  
 $C_4H_4O_2$  methyl propiolate - 25  
 $C_4H_4Se$  selenophene - 20  
  
 $C_4H_5ClO$  trans-chlorovinylacetaldehyde - 11  
 $C_4H_5FO$   $(CH_2CH_2CHCOF)$  cyclopropylcarboxylic acid fluoride - 19  
 $C_4H_5N$   $(CH_2=CHCH_2CN)$  allyl cyanide - 23 - 25  
 $C_4H_5N$  pyrrole - 4  
 $C_4H_6$  cyclobutene - 4  
 $C_4H_6$  bicyclobutane - 12  
 $C_4H_6$  methylenecyclopropane - 11  
 $C_4H_6$  methylcyclopropene - 11  
 $C_4H_6F_2$   $(CH_3CHCF_2CH_2)$  2,2-difluoro-1-methylcyclopropane - 31  
 $C_4H_6O$   $((CH_3)_2CCO)$  dimethyl-ketene - 5  
 $C_4H_6O$   $(\underline{CH_2CH_2CH}CHO)$  cyclopropylcarboxaldehyde - 19  
 $C_4H_6O$   $(CH_2=CHCHCH_2O)$  butadiene monoxide - 31  
 $C_4H_6O$  methylcyclopropenone - 11  
 $C_4H_6O$  3-methylene oxetane - 3  
 $C_4H_6O_2$  methyl acrylate - 25  
 $C_4H_6S$  dihydrothiophene - 21  
 $C_4H_7N$  3-pyrroline - 25  
 $C_4H_8$  butene-1 - 35  
 $C_4H_8$  butane-2 (and deuterated species) - 35  
 $C_4H_8O$   $((CH_3)_2CCH_2O)$  1,1-dimethylethylene oxide - 31  
 $C_4H_8O$  isobutyryl aldehyde - 25  
 $C_4H_8O$  ethyl vinyl ether - 25  
 $C_4H_8O$   $(C_3H_5CH_2OH)$  cyclopropyl carbinol - 23  
 $C_4H_8S_2$   $(S(CH_2)_2S(CH_2)_2)$  p-dithiane - 27  
 $C_4H_9$   $(CH_3\underline{CH_2CH_2}CH_2)$  methylcyclopropane - 31

- $C_4H_9I$  (( $CH_3$ ) $CI$ ) t-butyl iodide - 9
- $C_4H_9NO$  [ $NH(CH_2)_2O(CH_2)_2$ ] morpholine - 27
- $C_4H_9NO$  Si [( $CH_3$ ) $_3Si$  NCO] trimethyl silicon isocyanate - 2
- $C_4H_9NS$  [ $NH(CH_2)_2S(CH_2)_2$ ] thiomorpholine - 27
- $C_4H_9NS$  Si [( $CH_3$ ) $_3Si$  NCS] trimethyl silicon isothiocyanate - 2
- $C_5H_4OS$  pyran-4-thione - 8
- $C_5H_4OS$  thiapyran-4-one - 8
- $C_5H_4O_2$  pyran-4-one - 8
- $C_5H_5N$  pyridine - 4
- $C_5H_5NNiO$  [ $C_5H_5NiNO$ ] cyclopentadienyl nitrosyl nickel - 2
- $C_5H_5NOPt$  [ $C_5H_5PtNO$ ] cyclopentadienyl nitrosyl platinum - 2
- $C_5H_6F_2$  [ $CF_2=CHC(CH_3)=CH_2$ ] methyl-1,1-difluorobutadiene - 31
- $C_5H_6F_2$  [ $CF_2=C(CH_3)CH=CH_2$ ] 2-methyl-1, 1-difluorobutadiene - 31
- $C_5H_6O$  2-methylfuran - 16
- $C_5H_7N$  ( $CH_3C_4H_4N$ ) N-methyl-pyrrole - 5
- $C_5H_7N$  ( $CD_3C_4H_4N$ ) N-d<sub>3</sub>-methyl-pyrrole - 5
- $C_5H_8$  ( $CH_2=CHCH_2CH=CH_2$ ) 1,4-pentadiene - 35
- $C_5H_8$  ( $CH_2CH_2CHCHCH_2$ ) vinylcyclopropane - 19
- $C_5H_8$  isoprene - 11
- $C_5H_8$  ( $CH=C(CH_3)CH_2CH_2$ ) 1-methylcyclobutene (1) - 31
- $C_5H_8$  methylcyclobutene - 11
- $C_5H_8O$  2,3-dihydropyran - 25
- $C_5H_9ClSi$  (( $CH_3$ ) $_3Si-C=C-Cl$ ) trimethylsilicon-chloroacetylen - 37
- $C_5H_9O$  dimethylcyclopropenone - 11
- $C_5H_{11}N$  piperidine - 22
- $C_6H_4F_2$  o-difluorobenzene - 34
- $C_6H_4N_2S$  piazthiole - 8
- $C_6H_5F$  fluorobenzene - 4
- $C_6H_6$  dimethylenecyclobutene - 20
- $C_6H_6$  fulvene - 20
- $C_6H_6FN$  ( $FC_6H_4NH_2$ ) p-fluoroaniline - 8
- $C_6H_6O$  phenol - 4
- $C_6H_7N$  ( $CH_3C_5H_4N$ ) 2-methyl-pyridine - 5
- $C_6H_7N$  ( $C_6H_5NH_2$ ) aniline - 8
- $C_6H_{10}$  cyclohexene - 17 - 34
- $C_6H_{10}O$  cyclohexanone - 34
- $C_7H_7F$  ( $CH_3C_6H_4F$ ) meta-fluorotoluene - 5
- $C_7H_7FO$  p-fluoroanisole - 25
- $C_7H_8O$  ( $C_6H_5OCH_3$ ) anisole - 15
- $C_8H_{10}$  (( $CH_3$ ) $_2C_6H_4$ ) ortho-xylene - 5
- $C_9H_7N$  quinoline - 20
- $C_{10}H_8$  azulene - 27
- $C_{10}H_{15}F$ ;  $C_{10}H_{15}Cl$ ;  $C_{10}H_{15}Br$  haloadamantanes - 38
- $C_{12}H_{10}O$  (( $C_6H_5$ ) $_2O$ ) diphenyl ether - 15
- $ClF_4P$  phosphorous chloride tetrafluoride - 21
- $ClF_5$  chlorine pentafluoride - 21
- $ClNO_2$  nitryl chloride - 1
- $ClO$  chlorine monoxide - 21
- $ClO(2\pi\frac{1}{2})$  chlorine monoxide - 35
- $ClOP$  ( $POCl$ ) phosphoryl chloride - 7
- $Cl_2OS$  thionyl chloride - 32
- $Cl_2S$  ( $SCL_2$ ) sulfur dichloride - 7



$\text{Cl}_3\text{FSi}$  trichlorfluorsilane - 9  
 $\text{Cl}_3\text{HSi}$  trichlorsilane - 9  
 $\text{Cl}_3\text{P}$  ( $\text{PCl}_3$ ) phosphorus trichloride - 7  
 $\text{Cl}_5\text{Mo}$  molybdenum pentachloride - 9  
 $\text{CrF}_4$  chromium tetrafluoride - 20  
 $\text{FNO}_2$  nitryl fluoride - 1 - 38 - 35

$\text{F}_2\text{HOP}$  ( $\text{HF}_2\text{PO}$ ) hydrophosphoryldifluoride - 18

$\text{F}_2\text{HP}$  ( $\text{HPF}_2$ ) difluorophosphine - 18

$\text{F}_2\text{HPS}$  hydrothiophosphoryl difluoride - 25

$\text{F}_2\text{OSe}$  ( $\text{SeOF}_2$ ) selenium oxyfluoride - 20

$\text{F}_3\text{N}$  ( $\text{NF}_3$ ) nitrogen trifluoride - 35

$\text{F}_3\text{OP}$  phosphorus oxyfluoride - 15

$\text{F}_3\text{P}$  ( $\text{PF}_3$ ) phosphorous trifluoride - 35

$\text{F}_4\text{HP}$  ( $\text{HPF}_4$ ) monofluorophosphorane - 39

$\text{F}_4\text{Se}$  ( $\text{SeF}_4$ ) selenium tetrafluoride - 20

$\text{F}_6\text{OSi}_2$  ( $\text{SiF}_3\text{OSiF}_3$ ) perfluorodisiloxane - 21

$\text{GeO}$  germanium-monoxide - 6

$\text{GeTe}$  germanium-monotelluride

$\text{HNO}_2$  nitrous acid - 2

$\text{HNOS}$  thionylimide - 21

$\text{H}_2\text{Se}$  ( $\text{D}_2\text{Se}$ ) deuterium selenide - 1

$\text{N}_2\text{O}_3$  dinitrogen trioxide - 2 - 18

$\text{OSn}$  tin-monoxide - 6

$\text{OPb}$  lead oxide - 29

$\text{OSi}$  silicon-monoxide - 6

$\text{O}_2$  oxygen - 35

$\text{O}_2\text{S}$  ( $\text{SO}_2$ ) sulfur dioxide - 35

$\text{O}_2\text{S}$  ( $\text{S}^{33}\text{O}^{17}\text{O}^{17}$ ) sulfur dioxide - 14

$\text{O}_2\text{Se}$  ( $\text{SeO}_2$ ) selenium dioxide - 35

$\text{O}_3$  ozone - 35

$\text{SSn}$  stannous sulfide - 29

$\text{SnTe}$  tin-monotelluride - 6

† - Omitted in Formula Index

$\text{CH}_6\text{Si}$  ( $\text{CH}_3\text{SiH}_3$ ) methylsilane - 40

$\text{C}_2\text{H}_3\text{FO}_2$  ( $\text{CH}_2\text{F-COOH}$ ) fluoroacetic acid - 40

$\text{C}_3\text{H}_4\text{O}$  ( $\text{H}_3\text{C}\cdot\text{O}\cdot\text{C}\equiv\text{CH}$ ) methoxyethyne - 40