NITROGEN OXYCHLORIDES: 
A Bibliography on Data for Physical and Chemical Properties of ClNO, ClNO₂, and ClNO₃
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NITROGEN OXYCHLORIDES:

A Bibliography on Data for Physical and Chemical Properties of ClNO, ClNO₂, and ClNO₃

Francis Westley

Institute for Materials Research
National Bureau of Standards
Washington, D.C. 20234

Sponsored by:
Office of Standard Reference Data
National Bureau of Standards
Washington, D.C. 20234

Office of Air and Water Measurement
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Issued August 1977
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NITROGEN OXYCHLORIDES

[ A Bibliography on Data for Physical and Chemical Properties of ClN0, ClN02, and ClN03 ]

FRANCIS WESTLEY

A data oriented list of references is provided for published papers and reports containing measured or calculated data for the physical and chemical properties of nitrosoyl chloride, nitryl chloride, and chlorine nitrate with particular emphasis on the chemistry and chemical kinetics of these compounds. More than 387 papers are listed. The period covered extends from 1874 through 1977.

Keywords: Bibliography; chemical kinetics; chemistry; chlorine nitrate; molecular properties; nitrosoyl chloride; nitryl chloride; physical properties; spectral properties; thermodynamic properties.

INTRODUCTION

This bibliography lists papers and reports containing data for the chemical, molecular, physical, and thermodynamic properties of nitrosoyl chloride, ClN0, nitryl chloride, ClN02, and chlorine nitrate, ClN03, with particular emphasis on the chemical kinetics of these compounds. Among these, nitryl chloride has been recently found to exist in two isomeric forms by Molina who in 1977 identified by UV spectrometry the existence of nitryl chloride, ClN02, and its isomer ClN02. The later one was named by Molina: "chlorine nitrite" (by analogy with chlorine nitrate, whose structural formula is: ClO-N=O and which as also been referred to as: nitryl oxychloride).

The articles have been selected from the files of the Chemical Kinetics Information Center and the Chemical Abstracts (1874-1977). The particular properties for which data are published are indicated by flags. The abbreviations for data flagging are based on the Fourth Interim IUPAC List (C0DATA Bulletin 19, 20 (1976)). The list of IUPAC flags is completed by a short number of abbreviations for descriptive terms (e.g.: calculation, decomposition, etc.). These descriptive abbreviations apply mostly to Chemical Kinetics.

ClN0, ClN02, and ClN03 are potentially important in pollution and atmospheric chemistry. In particular, the chlorine nitrate formation in atmosphere seems to produce a decrease in the projected ozone reduction. For that reason, the physical and chemical properties of ClN03 have been the object of a number of recent studies.

It is believed that this bibliography provides extensive coverage of the available data for the physical and chemical properties of ClN0, ClN02, and ClN03. The more than 387 references indexed here span all physical and chemical properties of ClN0, ClN02, and ClN03. No claim is made that this bibliography is all-inclusive. Our past experience in the preparation of bibliographies has taught us that it is virtually impossible to identify and obtain every paper or to flag correctly every paper that has been retrieved. The author will welcome suggestions for additions and corrections or errors and thanks the contributors in advance.

This bibliography is not the result of the effort of a single person, but of the whole staff of Chemical Kinetics Information Center. My thanks to all of them.

In particular, I wish to thank Dr. David Garvin, Section Chief and Dr. Robert Hampson, Jr., Director of the Center, for their more than helpful suggestions and constant guidance; Dr. William R. Evans for his thorough editing and proofreading of the manuscript; Mr. James Koch, Supervisor, for tracking down and obtaining papers and reports, otherwise very difficult to obtain; Mrs. Geraldine Zumwalt and Miss Sheri Schroyer, for typing a difficult manuscript with particular care.
GUIDELINES FOR THE USER

Arrangement of the Report.

This bibliography is in four parts:
Part I. Nitrosyl Chloride - ClN\text{O}
Part II. Nitryl Chloride - ClN\text{O}_2
Part III. Chlorine Nitrate - ClN\text{O}_3
Part IV. The combined bibliographies for Parts I to III arranged chronologically by years and - within each year - alphabetically by authors. The complete reference for each article mentioned is given here: occasionally explanatory notes are appended. These establish the "bibliographic chain" for closely related papers by the same authors.

Each of the Parts I to III is subdivided into five parts:

- Chemistry and Chemical Kinetics
- Molecular Properties
- Physical Properties
- Spectral Properties
- Thermodynamic Properties

Each entry in parts I to III consists of an identification of the paper or report and a set of abbreviations that specify the types of data reported therein. These two features are explained below.

Reference Codes

Each paper or report included in Parts I to III is indicated by a reference code formed by a string of characters showing:
1.) Year (last two digits)
2.) Author or first two authors, using the first three letters of each last name (patronymic). When two names are present they are separated by a slash.
3.) If necessary a digit is added to distinguish among papers that would have the same codes according to rules (1) and (2).

Examples:
40 ASM
41 ATW/RG
53 ASH/CHA
53 ASB/CHA

The total length of the string, including the digit, may be no longer than 11 characters. A code without digit has, implicitly, the digit 1 associated with it.


Properties Codes

Following the year and author code, at five spaces distance, are the abbreviations for data flagging. These flags are taken from the Fourth Interim IUPAC Lists and their use is an experiment--testing the usefulness and completeness of the technique on a body of related data--and an attempt to achieve a substantial compression of information.

Although the IUPAC List includes 113 flags, this bibliography uses only 33 of them as listed below. The 80 flags not included indicate properties which have not yet been investigated for ClN\text{O}, ClN\text{O}_2, and ClN\text{O}_3. The flags for spectra are indicated by three capital initials, all other only by two initials.

Under the subheading "molecular properties" the year and author codes are followed by flags indicating only molecular properties. The same rule applies for the remaining four subheadings. The IUPAC List of Flags is supplemented by 11 codes for descriptive terms (e.g.: Clc - calculation; for from; formation from; Rev - Review; etc.). These descriptive codes include three letters the first being a capital. Only two descriptive codes have 7
The code "Rlp" means Related Paper and indicates that a paper does not report rate data, or quantum yields, or mechanisms, but may describe the synthesis of compound.

The flags for data appear first in alphabetical order, followed by the descriptive terms.

Examples:

**CIN6**

Chemistry and Chemical Kinetics

61 ASM/BUR Fr, Dec, Mec, Rxn with: Cl, N6, N62

which indicates that the paper by Ashmore and Burnett (1961) reports reaction rate data on the CIN6 decomposition, a mechanism of the reaction and some information on the reaction of CIN6 with Chlorine atoms, N6 and N62.

**CIN6**

Spectral Properties

74 BAL/ARM UVS, VIS

which indicates that the paper by Ballash and Armstrong (1974) reports studies on the CIN6 ultraviolet and visible spectra.

To find the complete references for the above examples (61 ASM/BUR and 74 BAL/ARM) the reader should look in Part IV under the subheadings 1961 and 1974, where the papers by Ashmore and Burnett (1961) and Ballash and Armstrong (1974) are listed alphabetically within the same year.

For easy location, each reference listed in Part IV is preceded by the year and author code.

The Properties Codes (including the IUPAC list for Data Flagging Abbreviations and--separately--the list for Descriptive Terms) follow below. For the convenience of the reader, these two lists are repeated in the last page of this bibliography, after the References.

*The complete IUPAC list is published in: C\*DATA (Committee on the Data for Science and Technology) Bulletin No. 12, "Flagging and Tagging Data," P. 20 ff. (June 1976, Paris, France)
# LIST OF ABBREVIATIONS

Abbreviations for Data Flagging
Fourth Interim IUPAC List

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<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>AB</td>
<td>Absorption Cross Section</td>
</tr>
<tr>
<td>BE</td>
<td>Bond Energy, Atomization Energy, Dissociation Energy</td>
</tr>
<tr>
<td>BA</td>
<td>Bond Angle, Bond Length</td>
</tr>
<tr>
<td>BT</td>
<td>Boiling Temperature (Boiling Point)</td>
</tr>
<tr>
<td>CD</td>
<td>Critical State Data (Critical Density, Critical Temperature, Critical Pressure)</td>
</tr>
<tr>
<td>DC</td>
<td>Dielectric Constant</td>
</tr>
<tr>
<td>DM</td>
<td>Dielectric Properties (Electric Dipole Moment, Molecular Polarization Quadrupole Coupling Constant)</td>
</tr>
<tr>
<td>DN</td>
<td>Density Data (Density, Specific Density)</td>
</tr>
<tr>
<td>EN</td>
<td>Entropy</td>
</tr>
<tr>
<td>EQ</td>
<td>Equilibrium Data (Equilibrium Constant)</td>
</tr>
<tr>
<td>ET</td>
<td>Enthalpy (Heat of Vaporization, Heat of Sublimation, Heat of Reaction)</td>
</tr>
<tr>
<td>HC</td>
<td>Heat Capacity</td>
</tr>
<tr>
<td>IP</td>
<td>Ionization Potential, Electron Affinity</td>
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<tr>
<td>IRS</td>
<td>Infrared Spectrum</td>
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<tr>
<td>MG</td>
<td>Magnetic Data, (Magnetic Dipole (and Higher) Moments, Magnetic Susceptibility)</td>
</tr>
<tr>
<td>ML</td>
<td>Molecular Energy Level, Rotational and Vibrational Constants, Force Constant, Moment of Inertia</td>
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<tr>
<td>MSS</td>
<td>Mass Spectrum</td>
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<tr>
<td>MT</td>
<td>Melting Temperature (Melting Point)</td>
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<td>MWS</td>
<td>Microwave Spectrum</td>
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<tr>
<td>NMS</td>
<td>Nuclear Magnetic Resonance Spectrum</td>
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<tr>
<td>QY</td>
<td>Quantum Yield (and Quantum Efficiency)</td>
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<tr>
<td>RAS</td>
<td>Raman Spectrum</td>
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<tr>
<td>RD</td>
<td>Radii (Atomic, Ionic, Molecular, Molecular Volume, Molecular Diameter, Molecular Cross Section)</td>
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<tr>
<td>RR</td>
<td>Reaction Rate Data (Rate Constant, Relaxation Time, Half-life)</td>
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<td>ST</td>
<td>Surface Tension</td>
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<tr>
<td>TC</td>
<td>Thermal Conductivity</td>
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<td>TE</td>
<td>Thermodynamic Energy Data (Gibbs Free Energy, Helmholtz Energy, Thermodynamic energy functions)</td>
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<td>UVS</td>
<td>Ultraviolet Spectrum</td>
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<tr>
<td>VIS</td>
<td>Visible Spectrum</td>
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<tr>
<td>VP</td>
<td>Vapor Pressure (Sublimation Pressure)</td>
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<td>VS</td>
<td>Viscosity Data</td>
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<tr>
<td>XPS</td>
<td>X-ray Photoelectron Spectrum</td>
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<td>XRS</td>
<td>X-ray Spectrum</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>Clc</td>
<td>Calculation</td>
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<tr>
<td>Dec</td>
<td>Decomposition</td>
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<tr>
<td>For from:</td>
<td>Formation from another compound</td>
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<tr>
<td>Mec</td>
<td>Mechanism</td>
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<tr>
<td>Phl</td>
<td>Photolysis</td>
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<tr>
<td>Rad</td>
<td>Radiation</td>
</tr>
<tr>
<td>Rev</td>
<td>Review</td>
</tr>
<tr>
<td>Rlp</td>
<td>Related Paper</td>
</tr>
<tr>
<td>Rxn with:</td>
<td>Reaction with other compounds</td>
</tr>
<tr>
<td>Syn</td>
<td>Synthesis (preparative methods)</td>
</tr>
<tr>
<td>Thp</td>
<td>Theoretical Paper</td>
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</table>
PART I

NITROSYL CHLORIDE

Chemistry and Chemical Kinetics

74 TIL Rlp, Rxn with: Au and Pt, Syn
91 SUD Rlp, Rxn with: metals
12 BRI/PYI Rlp, Syn
14 TRA RR, For from: N\textsubscript{6} and Cl\textsubscript{2}
15 TRA/HIN Dec, For from: N\textsubscript{6} and Cl\textsubscript{2}, Rlp
16 BRI For from: HN\textsubscript{o}{3} and HCl, Mec, Rlp, Rxn with: Cl\textsubscript{2} and H\textsubscript{2}O
16 TRA/HIN Dec, For from: N\textsubscript{6} and Cl\textsubscript{2}, Rlp
16 TRA/WAC Dec, For from: N\textsubscript{6} and Cl\textsubscript{2}
23 CUT/TAR Rlp, Rxn with: Cu\textsubscript{6} and Tl\textsubscript{2}O\textsubscript{6}, Syn
23 KIS RR, Dec, For from: N\textsubscript{6} and Cl\textsubscript{2}, Mec, Phl
24 KIS RR, For from: ClN\textsubscript{6}{2} and N\textsubscript{6}, Mec
24 TRA/GER Rlp, Syn
24 TRA/SCH RR, For from: N\textsubscript{6} and Cl\textsubscript{2}, Mec
25 BWO/SWA QY, Phl
27 GAL/MEN Rlp, Rxn with: MCl\textsubscript{n} (M = metal, n = 1 to 5), Syn
27 TAY/DEN RR, Dec
28 N\textsubscript{6}OY For from: NCl\textsubscript{3}, Rlp, Rxn with: NCl\textsubscript{3}
25 SCH/SPR1 Rlp, Rxn with: \textsubscript{6}{3}
25 SCH/SPR3 Rlp, Rxn with: \textsubscript{6}{3}
30 KIS QY, Dec, Mec, Phl, Rxn with: Cl
30 N\textsubscript{6}OY For from: NCl\textsubscript{3} and N\textsubscript{6}{1}, Mec
31 WHY/LUN Rlp, Rxn with: NaClH, Syn
34 TRA/FRE Dec, Rlp
35 WAD/TWL RR, Dec
37 KRA/SAR RR, For from: N\textsubscript{6} and Cl\textsubscript{2}
38 SCH RR, Dec, For from: N\textsubscript{6} and Cl\textsubscript{2}, Rev
38 WEL/TAY RR, Dec, For from: N\textsubscript{6} and Cl\textsubscript{2}
39 C6L/LIL Rlp, Syn
39 G66/KRA Rlp, Dec
39 NAT QY, RR, Mec, Phl
ASM  Rlp, Rxn with: MClₙ (M = metal, n = 1 to 5)
NAT  FR, Cle, Dec, Thp
ATW/RGL  QY, Phl
SCH  Rlp, Rxn with: 3
PAR/WHY  Rlp, Rxn with: M and MClₙ (M = metal, n = 1 to 5)
ADD/THGI  Rlp, Rxn with: N₂S₄, CCl₄, metals
DRG/ALL  RR, for from: HN₃, Rxn with: 3
PAR/WHYL  Rlp, Rxn with: M, MCl₃ and M(N₃)ₙ (M = metal, n = 1 to 4)
GG/WIL  Dec, For from: ClN₃₂, Rlp, Rxn with: N₂S₃ and S
BUR/MCK  Rlp, Rxn with: FeCl₃
BUR/DAI2  RR, Rxn with: Cl, C₆Cl
CHA/ASH  RR, Dec
FRE/JMH  RR, For from: ClN₃₂ and N₃
ASH/CHA1  RR, Dec, For from: Cl₂, Mec, Rxn with: Cl, M
ASH/CHA2  RR, Dec, Mec, Rxn with: Cl
ASH/CHA3  RR, Cle, For from: Cl₂
J6H/LEI  RR, Mec, Rxn with: S₃ and N₃
FRE  For from: Cl₂ and N₃, Mec, Thp
LEI  RR, Mec, Rxn with: S₃ and N₃
EPS/NIK  RR For from: HN₃ and NaCl or KCl
MAR/KOH  RR, Rxn with: Cl₆₂
RAY  RR, Mec, Rxn with: NO₂
PIT/POW  RR, Cle, Dec, For from: ClN₃₂ NO and Cl₂, Rxn with: Cl, Thp
ASH/LEV  Dec, Rlp
RAY/MGG  RR, Mec, Rxn with: NO₂
SCH/GIN  Rlp, Rxn with: ClN₃
ART/STR  For from: NO, Phl, Rxn with: C₆H₆, Cl
GL/GIN  For from: ClN₃₂ and H₂O or HCl, Rlp
GIN/GOD  RR, For from: ClN₃₂, H₂O, HN₃, Rxn with: Mesitylene
MAR  For from: Cl₂O and NO, Rxn with: N₂O₅
MAR/KOH  RR, Mec, Rxn with: Cl₂O, 6Cl, NO₂, NO₃
DUX/BAU  RR, Dec, For from: Cl₂, Phl, Rxn with: Cl
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<th>Reaction Details</th>
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<td>RR, Dec, For from: Cl&lt;sub&gt;2&lt;/sub&gt;, Mec, Rxn with: Cl</td>
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<td>59 NEU</td>
<td>QY, Phl</td>
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<td>59 TAL/THØ</td>
<td>RR, For from: HCl and NO&lt;sub&gt;2&lt;/sub&gt;, Mec</td>
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<td>60 FIN/LEE</td>
<td>QY, For from: Cl and NO, Phl, Rxn with: AlCl&lt;sub&gt;3&lt;/sub&gt;</td>
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<tr>
<td>60 GEØ</td>
<td>Rlp, Rev, Rxn with: Inorg. Salts, Syn</td>
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<td>60 MAR/WØH</td>
<td>RR, Dec, Mec, Phl, Rxn with: Cl</td>
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<td>60 MCK/FIN</td>
<td>Qy, For from: NO and Cl&lt;sub&gt;2&lt;/sub&gt;, Phl</td>
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<td>61 ASH/BUR</td>
<td>RR, Dec, Mec, Rxn with: Cl, NO&lt;sub&gt;2&lt;/sub&gt;</td>
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<td>61 BAS/NOR</td>
<td>Phl</td>
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<td>61 CAS/POL</td>
<td>RR, Rxn with: H</td>
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<td>61 DEK</td>
<td>RR, Dec, Mec, Rxn with: Cl</td>
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<td>61 MAR/WØH1</td>
<td>QY, RR, Dec, For from: NO and Cl&lt;sub&gt;2&lt;/sub&gt;, Mec, Rev, Rxn with: Cl</td>
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<tr>
<td>61 MAR/WØH2</td>
<td>QY, RR, Dec, For from: NO and Cl&lt;sub&gt;2&lt;/sub&gt;, Phl</td>
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<tr>
<td>61 RIC</td>
<td>RR, Mec, Rxn with: N&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;</td>
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<tr>
<td>61 WAR</td>
<td>Rlp, Rxn with: H&lt;sub&gt;2&lt;/sub&gt;</td>
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<tr>
<td>62 ASH/BUR</td>
<td>RR, Dec, Mec</td>
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<tr>
<td>62 BAS</td>
<td>Mec, Phl, Rxn with: Cl, NO</td>
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<td>62 BAS/NOR</td>
<td>Mec, Phl</td>
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<td>62 CHA/KHA</td>
<td>Rxn with: H</td>
<td></td>
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<tr>
<td>62 DEK/PAL</td>
<td>RR, Dec, Mec, Rxn with: Cl</td>
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<td>62 MAR/CHU</td>
<td>QY, Phl</td>
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<td>63 MER</td>
<td>Rlp, For from: NO and Cl&lt;sub&gt;2&lt;/sub&gt;, Phl</td>
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<td>63 WEI</td>
<td>Rlp, Rxn with: H&lt;sub&gt;2&lt;/sub&gt;O and SO&lt;sub&gt;3&lt;/sub&gt;</td>
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<td>Rlp, Rxn with: Cl&lt;sub&gt;2&lt;/sub&gt; and N&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;4&lt;/sub&gt;</td>
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<td>64 ASH/HER</td>
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<td>RR, Dec, Mec, Rxn with: Cl, H</td>
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<td>65 VAN/HEU</td>
<td>Rlp, Rxn with: SO&lt;sub&gt;3&lt;/sub&gt;</td>
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<td>65 ZEV</td>
<td>RR, Rxn with: N&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt; and NO&lt;sub&gt;3&lt;/sub&gt;</td>
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<td>66 CLY/STE</td>
<td>RR, Rxn with: H</td>
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<td>Dec, Rlp</td>
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<td>66 MAR</td>
<td>RR, Mec, Rxn with: Cl&lt;sub&gt;2&lt;/sub&gt;, OCl, NO&lt;sub&gt;2&lt;/sub&gt;, NO&lt;sub&gt;3&lt;/sub&gt;, N&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;</td>
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<td>66 PAP</td>
<td>QY, Mec, Phl, Rxn with: Alkanes</td>
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<td>66 PØL</td>
<td>Dec, Phl, Rxn with: Cl</td>
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<td>Rlp, For from: ClNO&lt;sub&gt;2&lt;/sub&gt; and SO&lt;sub&gt;2&lt;/sub&gt;</td>
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<td>67 CAL/PIT</td>
<td>QY, Mec, Phl, Rev</td>
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67 DEJ/LEG For from: NaS\textsubscript{2}Cl, Rlp
67 KUH Rlp, Rxn with: HF and Lewis acid fluorides
67 MIT/SIM Rlp, Phl, Thp
67 VAN Rlp, Rxn with: S\textsubscript{6}
68 AMI/KEF RR, Mec, Rxn with: \textit{d} \textsubscript{2}
68 GRI/C\textsubscript{6}S RR, Rxn with: Cs and Rb
68 LEN/\textit{\phi}KA QY, Dec, Phl
69 Bi\textit{\theta} Mec, Rxn with: Cl, N
69 HAT/HUS RR, Rxn with: I
69 TIM/DAR QY, RR, Dec, For from: Cl and N\theta, Mec, Phl, Rxn with: Cl
70 ANL Rxn with: H
70 FOR/SAI RR, Clc, Dec, Thp
70 G\text{\&}O/GRA Dec, k
71 DUN/FRE\textsubscript{1} RR, Mec, Rxn with: N
71 DUN/FRE\textsubscript{2} RR, Rxn with: \textit{d}
71 DUN/SUT RR, Rxn with: H
71 YAG/AMI Rlp, Rxn with: C and \textit{d} \textsubscript{2}
72 BEL/PER Rlp, Rxn with: \textit{\phi}lefins
72 BUS/W1L RR, Phl
72 C\text{\&}L/PER Rlp, Rxn with: H\textsubscript{2}\textit{d}
72 CLY/C\textsubscript{4}U1 RR, Rxn with: Br, Cl
72 CLY/C\textsubscript{4}U2 RR, Rxn with: Br, Cl
72 DEA/HUS RR, Rxn with: I
72 DIJ/SCH Dec, For from: N\theta\textsubscript{2} and HCl, Rlp, Rxn with: N\theta\textsubscript{2}
72 DUB/DEV Rlp, Syn
72 ENG/GAR Dec, Rlp
72 FOR/LIN QY, RR, Dec, For from: N\theta and Cl, Mec, Phl, Rxn with: Cl
72 MAL RR, Dec, Rxn with: Cl
72 MAR/R\text{\&}B RR, Mec, Rxn with: Cl\textsubscript{2}\textit{d}, \textit{\phi}Cl, N\theta\textsubscript{2}
72 MEN/MEN RR, Rxn with: H\textsubscript{2}
72 SER/L6B Rlp, Rxn with: Be or BeCl\textsubscript{2} and N\textsubscript{2}\textsubscript{\&}4
73 BRA/W\textit{\phi}Y RR, Rxn
73 FCK/EDE Rxn with: Ba, Ca, Mg, Sr
73 GAV Phl, Rlp, \textit{\ddbl}Rxn with: cyclohexane
73 JAN/ENG RR, Dec, For from: HCl, NN\theta\textsubscript{3}, Rev, Rxn with: Cl and Inorg. Comp., Syn
73 MAL/PAL RR, Dec
73 M\text{\&}V/KYA Rlp, Rxn with: Cyclic ethers
73 PRA/KAR QY, RR, Mec, Phl, Rxn with: I and R\textsuperscript{*} (R\textsuperscript{*} = alkyl)
73 SAV/LAC RR, Dec
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<td>Rlp, Rxn with: e^-</td>
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<td>Rlp, Rxn with: Ti6Cl2</td>
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<td>Dec, For from: Cl and N6, Mec, Phl, Rxn with: Cl</td>
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<td>BAL/BOL</td>
<td>Mec, Phl</td>
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<td>DEJ/HEU</td>
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<tr>
<td>ECK/EDE</td>
<td>Rxn with: Ba, Ca, Mg, Sr</td>
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<td>QY, Phl, Rxn, k, Mec</td>
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<td>KAR/PRA2</td>
<td>QY, RR, Mec, Phl, Rxn with: I and C3H7I</td>
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<td>PH6/KEF</td>
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<td>SCH/DR61</td>
<td>Rlp, Rxn with: HN63</td>
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<td>TSE/DR62</td>
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<td>DEG/KAC</td>
<td>QY, RR, Mec, Phl, Rxn with: polyethylene</td>
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<td>D6R/SCH</td>
<td>RR, Dec</td>
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<td>DUB/AMA</td>
<td>Rlp, Rxn with: TiCl3(RO)2, R = alkyl</td>
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<td>GAL/OST</td>
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<td>HAB/SCH</td>
<td>Rxn with: H and D</td>
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<td>KIR/SPR</td>
<td>Rlp, Rxn with: (CF2NCl)3</td>
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<td>LAZ/GAV</td>
<td>QY, Phl, Rxn with: Cycloalkanes</td>
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<td>Rlp, Rxn with: carbonyl complexes</td>
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<td>MAL/KAT</td>
<td>Rlp, Rxn with: AsBr3, PBr3, Ph3l, Ph3As</td>
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<tr>
<td>MAR1</td>
<td>Rlp, Rxn with: Pinene</td>
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<td>76 AMI/KEF</td>
<td>For from: Cl₂ and N₂H₄, Rlp</td>
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<td>76 AUS/RAK</td>
<td>Rlp, Rxn with: C₆H₁₃NH₂, (CH₃CH₂)₃N</td>
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<td>76 HIP/TRG</td>
<td>RR, For from: Cl and NO, Rxn with: Cl</td>
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<td>76 YSA/GAS</td>
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<td>76 KYU/CLA</td>
<td>Mec, Rxn with: Oximes</td>
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<tr>
<td>76 MIR/P6V</td>
<td>Rlp, Rxn with: Polycyclic Hydro.</td>
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<td>76 SCH</td>
<td>Rlp, Rxn with: Hydroxy polymers</td>
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<tr>
<td>76 SER/LEE</td>
<td>RR, Rxn with: Epoxides</td>
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<tr>
<td>76 V0S</td>
<td>Rlp, Rxn with: K₂(MO₃Cl₆)</td>
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<td>77 MOL/MOL</td>
<td>AB, UVS (for Cl₃NO, Chlorine Nitrite Isomer)</td>
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**ClNO**

Molecular Properties

<p>| 37 KET/PAL | B0, RD |
| 38 KET | BE, B0, ML |
| 39 BEE/Y0S1 | B0, ML |
| 43 KET | B0, DC, DM |
| 50 BER | B0, ML |
| 50 BUR/BER | B0, ML |
| 51 BEC/FES | B0, RD, Rev |
| 51 PUL/WAL | ML |
| 51 ROG/PIE | MG, ML |
| 52 BUR/MCK | DC |
| 52 EBE/BUR | ML |
| 54 SIE | ML, Clc |
| 55 KAP/SIM | B0, ML |
| 56 PIT/POW | EQ, ML |
| 57 TAN | B0 |
| 58 SUT | B0, Clc |
| 60 ERR | BE |
| 60 GEN | B0, DM, Rev |
| 60 LAN/FLE | ML |
| 61 LIN | B0 |
| 61 LUM | DM |
| 61 MAR/WH2 | B0, DC, DM, IP, MG, ML, RD, Rev |
| 61 MIL/PAN | B0, DM, ML |
| 61 ROG/WIL | B0 |
| 62 BEN | RD |
| 62 KHA | B0, ML |
| 62 MIR/FAV | ML |</p>
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C11N6

**Physical Properties**

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49 ADD/THO2  MT
49 PAR/WHY1  MT
49 PAR/WHY2  VP
51 BEC/FES  BT, DN, MT, ST, Rev
51 EPS/NIK  BT, VP
52 BUR/DAII  MT, VP
52 BUR/MCK  VP
50 GEN  BT, DN, MT, Rev
51 DEV/HIS  BF, ML, Clc
51 MAR/WGII  BT, CD, DN, ML, ST, VP, VS, Rev
52 BEN  CD, DN
52 SVE  TC, VS
63 WEL/ECK  VP
68 KUZ/EGE  CD
69 PAN/RIP  BT, CD
72 CET/WIL  BT, MT
72 DUB/DEV  MT
73 JAN/ENG  MT, VP, Rev
73 RAG  BT, CD, DN, MT, Rev
74 KRO/ROZ  VP
75 KRO/ROZ  VP
76 AMI/KEF  VP

ClNC

Spectral Properties

30 KIS  UVS, VIS
32 LEE/RAM  VIS
34 BAI/CAS  IRS
39 GGE/KAT  UVS, VIS
39 NAT  VIS
41 PRI-SIM  UVS
50 BER  NWS
50 BUR/BER  IRS
50 PIE/RG1  NWS
50 PIE/RG2  NWS
50 WIS/ELM  IRS
51 BEC/FES  IRS, UVS, VIS
51 PUL/WAL  IRS
51 RG/PIE  NWS
52 EBE/BUR  IRS
52 WGL/JON  IRS
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Thermodynamic Properties

12 BRI/PYL ET
15 TRA/HIN EQ
16 BRI ET
16 TRA/HIN EQ
16 TRA/WAC EQ
24 TRA/SCH EQ
27 GAL/MEN VP
31 DIX EN, EQ, ET
31 WHI/LUN ET, TE
32 LEE/RAM EN, EQ, ET, TE, Clc
36 BIC/RGS ET
38 JAH EN, EQ, ET, TE, Clc
39 BEE/YQS1 EN, EQ, ET, RC, TE
39 BEE/YQS2 EQ
40 ASM ET
41 PRI/SIM ET
41 SCH/MAS EQ, TE
46 DRG/GAL TE
49 PAR/WHY2 ET
50 BUR/BER EN, RC, TE
51 BEC/FES EN, EQ, ET, RC, Rev
51 PUI/WAL EN
57 RAY/GGG EQ
58 MAR/KGH ET
59 RAY/GGG EN, ET
60 GEO ET, Rev
61 MAR/WGH2 EN, EQ, ET, RC, TE, Rev
61 WAR EN, ET, TE
62 GOR EN, ET, RC, TE
62 SVE HC
65 CAL/GLA ET
65 VEN/MAR2 EN, RC, TE
66 NAG EN, RC, TE
68 GLU EN, ET, RC, TE
68 KUZ/EGG ET
68 LEN/OKA ET
68 WAG/EVA EN, ET, RC, TE
69 PAN/RIP ET
70 GGG/GRA ET
PART II

NITRYL CHLORIDE
ClNÖ₂

Chemistry and Chemical Kinetics

24 KIS
RR, For from: Cl and NÖ₂, Mec, Rxn with: NÖ

29 SCH/SPR1
Rlp, Syn

29 SCH/SPR2
RR, Dec

29 SCH/SPR3
RR, Dec, For from: ClNÖ and Ö₃, Mec

31 SCH/SPR
RR, Dec

47 SCH
Dec, For from: ClNÖ and Ö₃, Rxn with: NH₃, NaOH, AgNÖ₂, AgNÖ₃, Syn

48 PET
Rlp, Rxn with: NaOH, NH₃, Syn

50 GGG/WIL
For from: Cl₂, N₂Ö₄, N₂Ö₅, ClNÖ, Ö₂

52 BAT/SIS
Rlp, Rxn with: NH₃, metals, Inorg. oxides and salts

52 FRE/JOH
RR, Rxn with: NÖ

52 SEE/NÖG
Dec, Rlp, Rxn with: H₂L, N₃⁻, Syn

53 JOH/LEI
RR, For from: ClNÖ and NÖ₃

54 COR
RR, Dec

54 COR/JOH
RR, Dec, Mec, Rxn with: Cl

54 LEI
RR, For from: ClNÖ and Ö₃

55 MAR/KÖH
RR, For from: ClÖ₃ and ClNÖ

55 RAY
For from: Cl₂, ClNÖ, NÖ₂, Mec

55 SCH
Rlp, Rxn with: Cl₂Ö₆, H₂Ö₂, NaOH, NH₃, N₃⁻, Syn

56 HER/JOH
RR, Clc, Rxn with: NÖ, Thp

56 VOL/JOH
RR, Dec, Mec, Rxn with: Cl, H, NÖ

57 CAS
RR, Dec
57 RAY/SGG RR, For from: ClN6 and N62
57 SCH/FIN Rlp, Rxn with: ClN63
58 C61/GIN Rlp, Dec, Rxn with: C2H5, C2H5, HCl, H2S64, Syn
58 GIN/G6D RR, Rxn with: Alkylbenzenes, H26, HN62
58 MAR RR, For from: Cl6, N62, N265
58 MAR/KQH RR, Dec, For from: Cl6, N62, N63, ClN6, Mec
59 MAR/MEI RR, For from: Cl6, N265
55 NIK RR, Dec, Clc
59 TAL/TH6 For from: HCl and N264, Mec, Rxn with: N6
60 MAR/MEI RR, For from: Cl6, N62, N264, ClN6, Rxn with ClN63
61 ASH/BUR RR, Dec, Mec, Rxn with: N6 and ClN6
61 D6/H/WIL RR, Dec, Phl, Rxn with: Cl
61 HEU Rlp, Syn
62 ASH/BUR RR, Dec, Mec
62 HIR/MAR RR, Dec, Rxn with: 62
62 WIE/MAR RR, Clc, Dec, Thp
63 SIN RR, Clc, Dec, Rxn with: Cl, Thp
63 WEI Rlp, Rxn with: H26 and S63
65 VAN/HEU Rlp, For from: Inorg. Nitro Comp., Rxn with: S63
66 DRE Dec
66 MAR RR, For from: Cl6, Cl6, N62, N63, N265, ClN6, Mec
66 MIL Rlp, Syn
66 TAR/RAB Clc, Dec, Thp
67 BEG Rlp, Rxn with: 6lefins
67 DEJ/LEG For from: N6S6Cl and N264, Rlp
67 KUH Rlp, Rxn with: HF and Lewis acid fluorides
67 VAN For from: Inorg Nitro comp., Rlp
68 TAR/RAB Clc, Dec, Thp
69 PAU/SIN Rlp, Rxn with: H2S67, H2S64, SbCl5, BCl3
70 BEN/66N RR, Dec, For from: N62 and Cl, Mec, Rev, Rxn with: Cl
70 CAI RR, Dec
71 HIR Rlp, Rxn with: Lin(CH3)2, Syn
72 DUT RR, Dec
72 DUT/BUN RR, Dec
72 MAR/ROB RR, For from: Cl6, ClN6
72 PAU/AR6 Rlp, Rxn with: S63
73 JAN/ENG Dec, Rev, Rxn with: Inorg. subst., Syn
73 TR6 Dec, Thp
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RR, Dec, Rev, Rxn with: Cl

RR, For from: N₂O₂, ClNO₂, ClNO, Cl₂O, Mec, Rxn with: N₂O

Dec, Rlp, Rxn with: SF₅

RR, For from: N₂O and ClNO, Rxn with: N₂O

RR, Mec, Rxn with: N₂O

For from: Cl₂ and N₂O₄, Rlp

RR, Phl

RR, For from: ClNO₂, ClNO, and ClNO₂, Mec, Phl (for ClNO₂, Chlorine Nitrite Isomer)

**ClNO₂**

**Molecular Properties**

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66 MOR     BE, Clc
67 BER/MIL  ML
67 MUL/NAG  BC, Clc
67 NEL/LID  DM
67 NEM1     ML, Clc
67 NEM2     ML, Clc
68 MUL/KRE  ML, Clc
68 NEM      ML, Clc
69 FRE      ML, Clc
69 RAO      DM, ML
71 STU/PR6  BC, ML
72 COT/WIL  BC
72 SHI      ML
73 JAN/ENG  DM, Rev
75 FR6/LEE  IP

ClN\(_2\)

Physical Properties

29 SCH/SPR1 BT, DN, MT, VP
37 LUC     VS
48 PET     BT, DN, MT
57 GEI/RAT EN, EQ, HC, TE
58 C6L/GIN BT, MT
61 HEU     BT, MT, DN
62 BEN     CD, DN
66 DRE     TC
68 KUZ/EG6 CD
69 PAN/RIP  BT, CD
65 PAU/SIN FP
72 COT/WIL BT, MT
73 JAN/ENG VP, Rev

ClN\(_2\)

Spectral Properties

50 CGG/WIL IRS
54 RYA/WIL IRS, RAS
55 MIL/SIN MWS
56 CLA/WIL MWS
56 MAR/GAR UVS
58 COL/GIN IRS, UVS
58 MIL/SIN WMS
59 CLA/WIL WMS
59 RAY/EGG IRS
63 OGA/WGR WMS
65 WGR/TAN WMS
66 EAG/WEA WMS
66 MIL IRS
67 BER/MIL IRS
69 PAU/SIN IRS, RAS
70 MAS/BRO NMS
71 BAR/VAS IRS
71 HIR IRS
73 JAN/ENG IRS, Rev
74 CHR/SCH IRS, RAS
75 FRG/LFE XPS
75 FIL/GER WMS
76 BIR/JES AB, UVS
76 ILL/TAK AB, UVS
77 MEL AB, UVS (for both isomers: Cl*N2, Nitryl Chloride, and Cl*NO, Chlorine Nitrite)
77 MEL/MEL AB, UVS (for Cl*NO, Chlorine Nitrite Isomer)

\textbf{Cl*N2}

\textbf{Thermodynamic Properties}

29 SCH/SPRI ET
55 RAY EN, EQ, ET
57 GEI/RAT EN, EQ, HC, TE
57 RAY/EGG EQ
56 MAR/KCH ET
59 RAY/EGG EN, ET
60 GEO ET, Rev
61 KRI EN, HC, TE, Clc
61 LAR/MAR EN, HC, TE
61 PIL EN, HC
61 PUR/RAG EN, HC, TE
66 MIL EN, ET, HC, TE
67 BER/MIL EN, ET, HC, TE
68 GLU EN, ET, HC, TE
68 KUZ/EGG ET
68 WAG/EVA EN, ET, MC, TE
69 PAN/RIP ET
PART III

CHLORINE NITRATE
ClO$_3$

Chemistry and Chemical Kinetics

35 USH/CHI Rlp, Rxn with: 6lefins
36 USH/CHI Rlp, Syn
37 USH/CHI Rlp, Syn
55 MAR/JAC RR, For from: ClO, ClO$_2$, N$_2$O, Mec
56 MAR/GAR RR, For from: ClO$_2$, N$_2$O, Mec
57 SCH/BRÅ Rlp, Rxn with: ICl$_3$, S$_3$Cl$_4$, TiCl$_4$
57 SCH/FIN For from: ClO$_2$, ClO$_2$, ClOAsG$_5$, N$_2$O, N$_2$O$_5$, Rlp, Rxn with: HCl, N$_2$O, ClN$_2$, ClN$_2$O, Syn
58 MAR RR, For from: ClO$_6$, ClO$_2$, N$_2$O, N$_2$O$_5$, Mec
58 SKI/CAD Rlp
59 MAR/MEI RR, For from: ClO$_2$, N$_2$O, N$_2$O$_5$
60 MAR/MEI RR, For from: ClO$_2$, 6Cl, N$_2$O$_2$
61 CAF RR, Dec
61 CAF/SIC RR, Dec
61 FIN1 Rlp, Rxn with: 6lefins
61 FIN2 Rlp, Rxn with: 6lefins
61 SCH/BRÅ For from: ClO$_2$, N$_2$O, N$_2$O$_5$, Rxn with: Inorg. Solvent, Syn
66 MAR RR, For from: ClO$_2$, ClO$_2$, N$_2$O, N$_2$O$_5$, ClN$_2$, Mec
66 MIL Rlp, Syn
67 SCH1 Rlp, Syn
67 SCH2 Rlp, Syn
68 MUL/DEH Rlp, Rxn with: SbF$_3$Cl$_2$
70 BEN/8'N RR, Dec, Rxn with: N$_2$O, 6Cl, 6$_2$, Cl$_2$, Mec, Rev, Rxn with: 6Cl
74 KNA/MAR RR, Dec, Mec, Rxn with: Cl and N$_2$O
74 SCH/CHR Rlp, Rxn with: 6$_3$
75 C60/PRI RR, Rxn with: HCl
76 ROW/SPEI For from: ClO and N$_2$O, Phl, Rlp, Rxn with: 6
For from: Cl\(_6\) and N\(_6\)_2, Phl, Rxn with: 6

For from: Cl\(_6\) and N\(_6\)_2, Phl, Rlp, Rxn with: 6

For from: Cl\(_6\) and N\(_6\)_2, Phl, Rxn with: 6

For from: Cl\(_6\) and N\(_6\)_2, Phl, Rxn with: 6

RR, Rxn with: Cl

RR, Rxn with: 6, Syn

RR, Rxn with: 6, 6H

OY, Phl

C\(_{11}\)N\(_6\)_3

Molecular Properties

B6, Rlp

ML

ML

ML

BE, B6, ML

ML

C\(_{11}\)N\(_6\)_3

Physical Properties

BT, MT

BT, MT, VP

BT, MT, Rev

BT, MT

BT, VP

BT, MT

C\(_{11}\)N\(_6\)_3

Spectral Properties

UVS

IRS

IRS

IRS

IRS

IRS
74 CHR/SCH  IRS, RAS
74 SHA/SEL  RAS
75 AMO/FLE  RAS
76 BIR/JES  AB, UVS
76 ROW/SEP  UVS
76 SUE/JOH  MWS
77 BIR/JES  RR, Phl
77 GRA/TUA  AB, IRS
77 SMI/CHO  GY, PHL
77 KUR/MAH  RR, Rxn with: 0, 0H
77 RAV/DAV  RR, Rxn with: 0, 0H
77 MOL  AB, UVS

\[ \text{CLNG}_3 \]

Thermodynamic Properties:

60 GEN  ET, Rev
61 SCH/BRA  ET
67 MIL/BER  EN, ET, HC, TE
67 SCHI  ET
68 GLU  EN, ET, HC, TE
70 BEN/0'N  EN, ET, HC
74 KNA/MAR  ET
PART IV

References

1874


1891


1912


1914


1915


1916


1923


1931


1932


1934


1935


1936


1937


1938


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1940


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53 J6H/LEI

53 WAL

1954

54 C6R

54 C6R/J6R

54 FRE

54 HAS/JAN

54 LEI

54 RYA/WIL

54 SIE

1955

55 EPS/NIK

55 KAW/SIM

55 MAR/JAC

55 MAR/KOH

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55 RAY

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1958


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1964

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1965


1966


1967

67 BEG

67 BER/MIL

67 CAL/PIT

67 DEJ/LEG

67 EUN

67 MIL/BER

67 MIT/SIM

67 MUL/NAG

67 NEL/LID

67 NEM1

67 NEM2

67 PAP

67 SCH1

67 SCH2

67 VAN

1968

68 AMI/KEF

68 GLU

68 GRI/CDS

68 JON/KYA


1969


1970


1970

70 CAI

70 FER/SAI

70 GEC/GEA

70 MAS/BRG

1971

71 BAR/VAS

71 DUN/FRE1

71 DUN/FRE2

71 DUN/SUT

71 HIR

71 RAM/NAM

71 RAJ/PGU

71 STU/PRG

71 YAG/AMI

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74 HOE/WAD  

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1977


LIST OF ABBREVIATIONS

Abbreviations for Data Flagging
Fourth Interim IUPAC List

AB  Absorption Cross Section
BE  Bond Energy, Atomization Energy, Dissociation Energy
BO  Bond Angle, Bond Length
BT  Boiling Temperature (Boiling Point)
CD  Critical State Data (Critical Density, Critical Temperature, Critical Pressure)
DC  Dielectric Constant
DM  Dielectric Properties (Electric Dipole Moment, Molecular Polarization Quadrupole Coupling Constant)
DN  Density Data (Density, Specific Density)
EN  Entropy
EQ  Equilibrium Data (Equilibrium Constant)
FT  Enthalpy (Heat of Vaporization, Heat of Sublimation, Heat of Reaction)
HC  Heat Capacity
IP  Ionization Potential, Electron Affinity
IRS  Infrared Spectrum
MG  Magnetic Data, (Magnetic Dipole (and Higher) Moments, Magnetic Susceptibility)
ML  Molecular Energy Level, Rotational and Vibrational Constants, Force Constant, Moment of Inertia
MSS  Mass Spectrum
MT  Melting Temperature (Melting Point)
MWS  Microwave Spectrum
NMS  Nuclear Magnetic Resonance Spectrum
QY  Quantum Yield (and Quantum Efficiency)
RAS  Raman Spectrum
RD  Radii (Atomic, Ionic, Molecular, Molecular Volume, Molecular Diameter, Molecular Cross Section)
RR  Reaction Rate Data (Rate Constant, Relaxation Time, Half-life)
ST  Surface Tension
TC  Thermal Conductivity
TE  Thermodynamic Energy Data (Gibbs Free Energy, Helmholtz Energy, Thermodynamic energy functions)
UVS  Ultraviolet Spectrum
VIS  Visible Spectrum
VP  Vapor Pressure (Sublimation Pressure)
VS  Viscosity Data
XPS  X-ray Photoelectron Spectrum
XRS  X-ray Spectrum
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<td>Rxn with</td>
<td>Reaction with other compounds</td>
</tr>
<tr>
<td>Syn</td>
<td>Synthesis (preparative methods)</td>
</tr>
<tr>
<td>Thp</td>
<td>Theoretical Paper</td>
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</tbody>
</table>
NOTE ADDED IN PROOF

Part III

Chlorine Nitrate
\( \text{ClNO}_3 \)

Chemistry and Chemical Kinetics

77 BIR/SHO RR, For from: \( \text{ClO} \) and \( \text{NO}_2 \), Rxn with: \( \text{HCl}, \text{NO}, \text{NO}_2, \text{O}_2 \)
77 LEU/LIN RR, For from: \( \text{ClO} \) and \( \text{NO}_2 \)
77 ZAH/CHA RR, For from: \( \text{ClO} \) and \( \text{NO}_2 \), Rxn with: \( \text{OH} \)

Part IV

References

1977


77 LEU/LIN Leu, M. T., Lin, C. L., and DeMoore, W. B., "Rate Constant for Formation of Chlorine Nitrate and by the Reaction \( \text{ClO} + \text{NO}_2 + \text{M} \)," J. Phys. Chem. 81, 190 (1977)

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   A data oriented list of references is provided for published papers and reports containing measured or calculated data for the physical and chemical properties of nitrosyl chloride, nitril chloride, and chlorine nitrate with particular emphasis on the chemistry and chemical kinetics of these compounds. More than 387 papers are listed. The period covered extends from 1874 through 1977.

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