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## Chemical Kinetics in the C-O-S and H-N-O-S Systems:

A Bibliography—  
1899 through June 1971

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# Chemical Kinetics in the C-O-S and H-N-O-S Systems: A Bibliography - 1899 through June 1971

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Washington, D.C. 20234

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## FOREWORD

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The task of critical evaluation is carried out in various data centers, each with a well-defined technical scope. A necessary preliminary step to the critical evaluation process is the retrieval from the world scientific literature of all papers falling within the scope of the center. Each center, therefore, builds up a comprehensive well-indexed bibliographical file which forms the base for the evaluation task. Since these bibliographical records are potentially of value to many research workers and others interested in the particular technical area, it seems desirable to make them generally available.

Further information on NSRDS and the publications which form the primary output of the program may be obtained by writing to the Office of Standard Reference Data, National Bureau of Standards, Washington, D. C. 20234.

David R. Lide, Jr.,  
Chief, Office of Standard  
Reference Data



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CHEMICAL KINETICS IN THE C-O-S AND H-N-O-S SYSTEMS:

A BIBLIOGRAPHY - 1899 through June 1971<sup>‡</sup>

FRANCIS WESTLEY

A bibliography, a reaction oriented list of references, is provided for published papers and reports containing rate data for reactions of COS, COS<sub>2</sub>, CS, CS<sub>2</sub>, CS<sub>3</sub>, D<sub>2</sub>S, H<sub>2</sub>S, H<sub>2</sub>S<sub>2</sub>, HSO<sub>2</sub>, S, SH, SO, SO<sub>2</sub>, SO<sub>3</sub>, SO<sub>4</sub>, S<sub>2</sub>, S<sub>2</sub>O<sub>2</sub>, S<sub>4</sub>, S<sub>6</sub> and S<sub>8</sub> with each other and with CO, CO<sub>2</sub>, D, D<sub>2</sub>, H, H<sub>2</sub>, H<sub>2</sub>O, N, N<sub>2</sub>, N<sub>2</sub>O, N<sub>2</sub>O<sub>5</sub>, NO, NO<sub>2</sub>, NO<sub>3</sub>, NOS, O, OH, O<sub>2</sub>, O<sub>3</sub>, R and RH. Three lists of critical reviews dealing with the above reactions are included. 317 papers covering 240 reactions are listed. The period covered extends from 1899 through June 1971.

Key words: Bibliography; carbon oxysulfides; carbon sulfides; chemical kinetics; gas phase; hydrogen; nitrogen; nitrogen oxides; oxygen; sulfur; sulfur hydrides; sulfur oxides.

#### Introduction

This bibliography lists papers and reports on the gas phase reaction kinetics in the carbon - oxygen - sulfur, carbon - sulfur, and hydrogen - nitrogen - oxygen - sulfur systems. The material is presented in two ways: (1) by reaction, listing each pertinent article and (2) in a general reference list, arranged alphabetically by first author.

The articles have been selected from the files of the Chemical Kinetics Information Center. The criterion for inclusion of an article is that there must be some new information on the reaction, when the article in question is compared with the chronologically preceding ones. That is, simple quotations of the results of others and ad hoc guesses have been excluded. There are gray areas, such as the statement of a rate calculated from that of the reverse reaction and the equilibrium constant, or mechanistic information. If the information seemed to be important the reference was included.

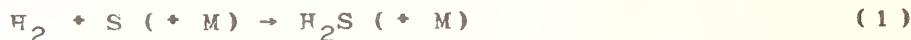
Most of the reactions listed in this bibliography show a chemical change. Some of these show a photolytic, chemiluminescent or energy transfer process that occurs simultaneously

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‡ This project is an activity of the Chemical Kinetics Information Center, N.B.S. The work was supported by the Office of Standard Reference Data, N.B.S., and the Naval Ordnance Systems Command ORD 3311 as part of a program to foster the production of tables of chemical kinetics.

with chemical change. In addition there are a few reactions that are simply collisional energy transfer or photo excitation processes.

Symbols defining specific electronic or vibronic states are not used. Instead an excited atom or molecule is indicated by a simple asterisk. The nature of a collisional process is indicated in an explanatory parenthesis following the reaction.

Some of these reactions have been studied since the early days of chemical kinetics. For instance, the reaction for the  $H_2S$  synthesis from its elements:



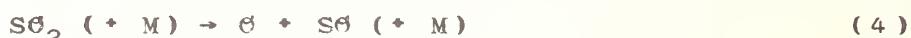
was studied kinetically for the first time by Bodenstein<sup>5)\*</sup>, just before the end of 19th century. Its study was continued in the nineteen twenties by Norrish and Rideal<sup>20, 21, 23)</sup> and in the thirties by Aynsley<sup>1, 2, 3)</sup>. The oxidation of  $H_2S$  by molecular oxygen



was studied for the first time in 1928 by Chamberlin and Clarke<sup>6)</sup> who measured the flame velocities of this reaction. The first rate studies were undertaken by Farkas<sup>10)</sup> in 1931 and - at about the same time - by Taylor and Livingston<sup>32), Thompson<sup>33)</sup> and Kelland<sup>34)</sup>. The synthesis of  $SO_2$  from its elements</sup>



was studied by Norrish and Rideal<sup>21, 22)</sup> in 1923. Gaydon<sup>11)</sup>, in 1934, offered a mechanism for the fluorescence of heated  $SO_2$ :



The photokinetics of sulfur oxides is a few decades older than the Gaydon mechanism. For instance, in 1907, Coehn<sup>7)</sup> and a few years later Coehn and Becker<sup>8)</sup> studied the photooxidation of  $SO_2$  by molecular oxygen, as well as the photodissociation of  $SO_3$  to  $O_2$  and  $SO_2$ :



Studies of the kinetics of carbon sulfides and carbon oxysulfides are relatively recent, the ground work in this field being laid down by Kondrat'ev<sup>17, 18, 19)</sup> and Jakovleva<sup>16)</sup> in 1938 and 1940.

In the field of energy transfer reactions, the first study for the vibrational relaxation of an excited  $SA_2$

molecule was performed by Schweikert<sup>29)</sup> in 1915, by using sound absorption techniques. Major advances in understanding the kinetics and mechanism of fluorescence and quenching of the electronically excited  $SA_2$  molecule were made by

\* Superscript figures indicate the literature references listed at the end of the introduction

Halstead<sup>12, 13, 14)</sup>, Thrush<sup>35)</sup> and Calvert and  
coworkers<sup>4, 9, 15, 24, 25, 26, 27, 28, 30, 31)</sup>.

This short historical survey of the gas phase reaction kinetics in the hydrogen - oxygen - sulfur system, extending from the beginning of the century until today, allows a comparison with kinetic history of nitrogen - oxygen system for the same period of time. As pointed out in a previous N - O chemical kinetics bibliography<sup>37)</sup>, the experimental work on the nitrogen - oxygen system started at the beginning of this century and - since then - has been continuing uninterrupted. The abundance of experimental kinetic studies for this system is such that many chemists have undertaken reanalyses of the existing data with the goal of establishing "best values". The number of critical reviews for the kinetics of the N - O system is impressive. Moreover, the molecular structure of these molecules has been established and their electronic and vibrational spectra analyzed (with the important exception of the visible bands of NO<sub>2</sub>). These structural and kinetic data make it possible to answer, quantitatively, questions about the behavior of these molecules in a polluted atmosphere.

Turning now to the hydrogen - nitrogen - oxygen - sulfur system, the picture is completely different: the number of papers dealing with the kinetics of this set, from the beginning of the century until today, is about one third of the corresponding number of papers in the N - O system, in spite of the fact that the number of reactions studied in the sulfur set is almost equal to the number of reactions in the nitrogen - oxygen system. The uncertainty of the existing kinetic data in the H - N - O - S system is such that few attempts have been made to establish best values for the rates. The number of critical reviews is disappointingly small. Furthermore, the interpretation of spectral data is not nearly so complete as for the nitrogen oxides.

The state of the matter has been very well described in a paper by Urone and Schroeder<sup>36)</sup> entitled: "SO<sub>2</sub> in the atmosphere: a wealth of monitoring data, but few reaction rate studies." The conclusion of these authors is valid for the whole H - N - O - S system. It is only too obvious that sulfur, together with its inorganic and organic compounds, should be at least as important for the pollution scientist as the simpler N - O system. Indeed, sulfur, or its compounds, is not a component of the "pure" air, but a villain, and - maybe - one of the greatest villains. Sulfur and its compounds are present in volcanic emissions and in fuel combustion products as rubber and tires, automobile exhausts, industrial wastes, synthetic fibers, and so on. And, from these sources, it goes into the atmosphere, in one form or another, polluting it.

For these reasons, the editor hopes that this bibliography by summing up what has been done in the field of chemical kinetics of the H - N - O - S system, will make it possible to establish - by difference - what remains to be done in this field. Should this be done, it would allow the kineticists, the spectroscopists and the quantum chemists to plan a concerted, more thorough study of this system.

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, Director of the Center, for his more than helpful suggestions and constant guidance; Mr. James G. Koch, Supervisor, for tracking down and obtaining papers and reports, otherwise very difficult to obtain; Mrs. Ann C. Robertson and Mrs. Geraldine W. Zumwalt, for typing a difficult manuscript with particular care.

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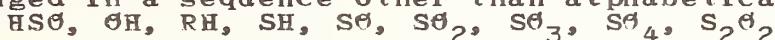
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## GUIDELINES FOR THE USER

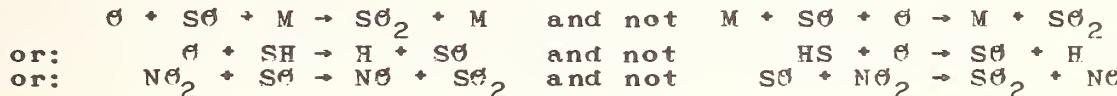
The goal of this bibliography is to survey the chemical reactions in the C - S - S, C - S and H - N - O - S systems. Energy transfer and photo-excitation processes are included only when they appear (to us or to the original author) to be important in the mechanisms of chemical processes. The bibliography lists references to published papers and reports in which rate data are reported for reactions of COS, COS<sub>2</sub>, CS, CS<sub>2</sub>, CS<sub>3</sub>, D<sub>2</sub>S, H<sub>2</sub>S, H<sub>2</sub>S<sub>2</sub>, HS<sub>2</sub>, S, SH, S<sub>2</sub>, S<sub>2</sub><sup>+</sup>, S<sub>3</sub>, S<sub>4</sub>, S<sub>2</sub><sup>2-</sup>, S<sub>4</sub>, S<sub>6</sub> and S<sub>8</sub> with each other and with CH, CH<sub>2</sub>, D, D<sub>2</sub>, H, H<sub>2</sub>, H<sub>2</sub>S, N, N<sub>2</sub>, N<sub>2</sub>O, N<sub>2</sub>O<sub>5</sub>, NO, NO<sub>2</sub>, NO<sub>3</sub>, NOS, O, OH, O<sub>2</sub>, O<sub>3</sub>, R and RH. Among these compounds, nine of them include atoms arranged in a sequence other than alphabetical, namely:



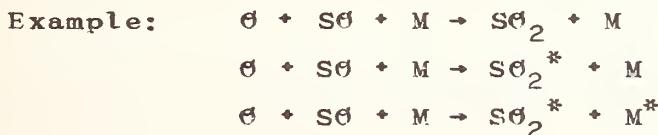
The sequence of atoms in each of these compounds is based on traditional convention. As written above, all three sequences of atoms, free radicals and molecules define the order in which the reactions are arranged, i.e.: semi-alphabetically by first reactant.

The rule for writing the chemical equations dealing with the above listed compounds is very simple. Within each reaction the reactants and products are arranged according to the same scheme: separately and alphabetically. The general "third body", M, is always last. This rule would be best defined by some illustrative examples.

So, one should write:



This ordering scheme runs counter to chemical conventions that order by oxidation state. It does bring the atom and its parent molecule together for this simple collection. The rule for arrangement is also simple. It is a character by character comparison, with the priority order being blank, numerals, and then letters. Chemical symbols without asterisk (ground state) take precedence over those with asterisk (excited state).



The bibliography is in four parts:  
Part I. Reactions of Carbon Oxysulfides,  
Part II. Reactions of Carbon Sulfides and  
Part III. Reactions of Sulfur, Sulfur Hydrides and Sulfur Oxides.

Part-IV. Is the combined bibliography for Parts I, II and III, arranged alphabetically by authors. The complete reference citation for each article mentioned is given here. Occasionally explanatory notes are appended. These establish

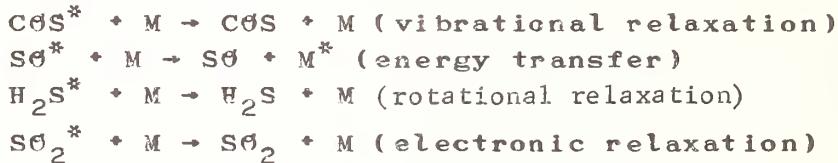
the "bibliography chain" for closely related papers by the same authors.

Parts I to III are arranged by reaction, following the order indicated above. Forward and reverse reactions are listed separately. Reactants are always on the left.

At the end of these parts, the sections I(b), II(b), and III(b) each include a short list of critical reviews or surveys dealing with the reactions listed in sections I(a), II(a), and III(a), respectively.

Most of the reactions listed in parts I, II and III show a chemical change. Some of these show a photolytic, chemiluminescent or energy transfer process that occurs simultaneously with chemical change. In addition there are a few reactions that are simply collisional energy transfer or photo-excitation processes.

Symbols defining specific electronic or vibronic states are not used. Instead, an excited atom or molecule is indicated by a simple asterisk. The nature of a collisional process is indicated in our explanatory parenthesis following the reaction e.g.:

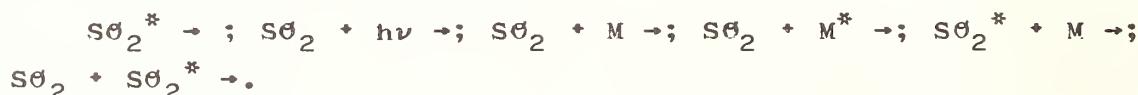


The chemical equations of the overall reactions are not always balanced. An unbalanced equation indicates that the author mentions the reactants and the products of the reaction without the help of an equation, or that the chemical equation given by the author is unbalanced.

Very often, a reference mentioning a reaction without a third body, M, will be found under a heading indicating the same reaction with M on both sides.

In order to render the chemical change occurring in a reaction easily observable to the eye, a reactant, or a product may appear two, or even three times in the same heading (e.g.:  $\text{SH} + \text{SH} \rightarrow \text{H}_2\text{S} + \text{S}$ ,  $\text{SO} + \text{SO}_3 \rightarrow \text{SO}_2 + \text{SO}_2$ ,  $\text{S}_2\text{O}_2 + h\nu \rightarrow \text{SO} + \text{SO}$ ).

It is felt that the most profitable method for finding references dealing with a certain reaction included in this bibliography would be to consider first all headings with the same reactants, with or without third body M, with or without  $h\nu$ , in excited or ground state, and regardless of the products. Only thereafter should the user accept or reject a paper, according to his own objective. As an example: Decomposition of  $\text{SO}_2$ . The user should consider the reactions having on the left side:



The references under each reaction list the author(s) and the sources, in the following form:

| Author(s)           | Source-Year-Volume-Page | Number of Author(s) |
|---------------------|-------------------------|---------------------|
| Thompson, H. W.     | NATUA-1931-127-629      | 1                   |
| Halstead and Thrush | PRLAA-1966-295-380      | 2                   |
| Collier, et al.     | JACSA-1970-92-217       | 3 or more           |

The sources are indicated by their ASTM CODEN abbreviations\*). A guide to these codes follows. A code prefixed with an asterisk is a code not in the ASTM CODEN set. These are codes we have assigned for reports from industrial laboratories, research institutes and universities. When the CODEN system adopts appropriate codes they will be replaced. The present, temporary codes usually end with Z or U. They are at times derived from the company name and at times from their stock symbols.

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\*). Blumenthal, J. G., Karaman, M., and Peters, A., Editors, "CODEN FOR PERIODICAL TITLES" (Including Non-Periodical Titles and Deleted Coden), Vol. I and II, ASTM Data Series DS 23\_B, (1970). (American Society for Testing and Materials, 1916 Pace St., Philadelphia, Penna. 19103).

JOURNAL AND REPORT CODES

|        |   |
|--------|---|
| AANLA  | Atti della Accademia Nazionale dei Lincei, Rendiconti Classe di Scienze Fisiche, Matematiche e Naturali (Rome)                |
| ACPYA  | Acta Physicochimica U.R.S.S. (Moscow)   |
| ACSRA  | Abstracts of Papers. American Chemical Society (Washington)   |
| ACUSA  | Acustica (Stuttgart/Zurich)   |
| ADPCA  | Advances in Photochemistry (London/New York)  |
| AJCHA  | Australian Journal of Chemistry (East Melbourne)  |
| ANPYA  | Annalen Der Physik (Leipzig)  |
| *APCPZ | Air Pollution Control Association Preprints   |
| APPLA  | Applied Physics Letters (New York)  |
| ARPLA  | Annual Review of Physical Chemistry (Stanford, Calif.)  |
| ATENB  | Atmospheric Environment. An International Journal (Oxford)  |
| *AVEVZ | AVCO - Everett Research Report  |
| AWPQA  | Air and Water Pollution (Oxford)  |
| BBPCA  | Berichte Der Bunsengesellschaft Fuer Physikalische Chemie (Weinheim, Germany)   |
| BOOKA  | Book  |
| BSCBA  | Societes Chimiques Belges, Bulletin (Brussels)  |
| CBFMA  | Combustion and Flame (London)   |
| CCAMA  | Chemical Communications (London)  |
| CHMBA  | Chemistry in Britain (London)   |
| CHPLB  | Chemical Physics Letters (Amsterdam)  |
| CJCHA  | Canadian Journal of Chemistry (Ottawa)  |
| CRAUA  | Comptes Rendus (Doklady) De L'Academie Des Sciences De L'U.R.S.S (Moscow)   |
| CSAAA  | Chemical Society, Annual Reports on the Progress of Chemistry, Section A. General, Physical, and Inorganic Chemistry (London) |
| DABBB  | Dissertation Abstracts International B. The Sciences and Engineering  |
| DABSA  | Dissertation Abstracts B. Sciences and Engineering  |
| DFSEA  | Discussions of the Faraday Society (Aberdeen, Scotland)   |
| DKPCA  | Doklady Physical Chemistry, Proceedings of the Academy of Sciences of the U.S.S.R. (New York)                                 |
| ESTHA  | Environmental Science and Technology (Washington)   |
| ESTMA  | Est Metallurgique (Besancon, France)  |
| FUSJA  | Fuel Society Journal, University of Sheffield (England)   |
| *GCABZ | GCA (Geophys. Corp. Am.), Bedford, Mass., GCA Technolo Division, Air Force Weapons Lab. Technical Reports                     |
| HCACA  | Helvetica Chimica Acta (Basel)  |
| HHHPA  | Hua Hsueh Hsueh Pao (Peking)  |
| TANKA  | Izvestia Akademii Nauk S.S.S.R., Otdelenie Khimicheskikh Nauk (Moscow)  |
| IECHA  | Industrial and Engineering Chemistry (Washington)   |

|        |  |
|--------|--|
| IJCKB  | International Journal of Chemical Kinetics (New York)  |
| *IUAPZ | International Union of Air Pollution Prevention Association (Washington, D.C., December 6-11, 1970) Preprint   |
| JACSA  | Journal of the American Chemical Society (Washington)  |
| JAPIA  | Journal of Applied Physics (New York)  |
| JAPUA  | Journal of Applied Chemistry of the U.S.S.R. (New York) English Translation of Zh. Prikl. Khim.  |
| JASMA  | Journal of the Acoustical Society of America (New York/Lancaster, Pa.)   |
| JCPSA  | Journal of Chemical Physics (New York)   |
| JCSIA  | Journal of the Chemical Society, A. Inorganic, Physical, Theoretical (London)  |
| JCSOA  | Journal of the Chemical Society (London)   |
| JEPCA  | Journal of Engineering for Power, Series A of the Transactions of the A.S.M.E. (American Society of Mechanical Engineers) (New York)   |
| JPCAA  | Journal of the Air Pollution Control Association (Pittsburgh)  |
| JPCHA  | Journal of Physical Chemistry (Washington/Ithaca, N.Y.)  |
| JQSRA  | Jurnal of Quantitative Spectroscopy and Radiative Transfer (Oxford/New York)   |
| KGKZA  | Kogyo Kagaku Zasshi (Tokyo)  |
| KHVKA  | Khimiiia Vysokikh Energii (Moscow)   |
| MDPCA  | Memoirs of the Defense Academy, Mathematics, Physics, Chemistry and Engineering (Yokosuka City, Japan)   |
| NACGA  | Nachrichten Der Akademie Der Wissenschaften in Goettingen, Mathematisch - Physikalische Klasse, Iia. Mathematisch - Physikalisch - Chemische Abteilung (Goettingen, Germany) |
| NASCA  | National Aeronautics and Space Administration, Technical Note (Washington)   |
| NATUA  | Nature (London)  |
| NUCIA  | Nuovo Cimento (Bologna, Italy)   |
| OPSUA  | Optics and Spectroscopy USSR (Washington) English Translation of Optika i Spektroskopiya   |
| PHCBA  | Photochemistry and Photobiology, an International Journal (Oxford/New York)  |
| PHYSA  | Physica (Amsterdam/Utrecht)  |
| *PICFZ | Proceedings of the International Conference on the Mechanism of Corrosion by Fuel Impurities (Marchwood, near Southampton, Hampshire, England, 20th-24th, May 1963)          |
| PLSSA  | Planetary and Space Science, Including Translations Concerned with the Physical Sciences Published in "Iskusstvenny Sputniki Zemli" (Oxford)                                 |
| PRLAA  | Proceedings of the Royal Society, Series A. Mathematical and Physical Sciences (London)  |
| SCIEA  | Science. American Association for the Advancement of Science (Washington)  |
| SYMCA  | Symposium on Combustion (International)  |
| TELLA  | Tellus (Stockholm)   |
| TFSCA  | Transactions of the Faraday Society (Aberdeen, Scotland/London)  |

|       |  |
|-------|--|
| ZAACA | Zeitschrift Fuer Anorganische Allgemeine Chemie<br>(Leipzig/Hamburg)   |
| ZEELA | Zeitschrift Fuer Elektrochemie (Weinheim/Halle,<br>Germany)  |
| ZEPCA | Zeitschrift Fuer Physikalische Chemie, Stoichiometrie<br>und Verwandschaftslehre (Leipzig/Berlin)                      |
| ZETFA | Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki<br>(Moscow)  |
| ZFKHA | Zhurnal Fizicheskoi Khimii (Moscow)  |
| ZPCBA | Zeitschrift Fuer Physikalische Chemie, Abteilung F.<br>Chemie Der Elementarprozesse, Aufbau Der Materie<br>(Leipzig)   |
| ZPCFA | Zeitschrift Fuer Physikalische Chemie (Frankfurt am<br>Main)   |
| ZPCLA | Zeitschrift Fuer Physikalische Chemie (Leipzig)  |
| 13DFA | Preprints of Papers Read at the International<br>Symposium on Free Radicals, 5th Symposium, Uppsala,<br>July 6-7, 1961 |
| 18MNA | Proceedings of the International Congress of Pure<br>and Applied Chemistry, 11th Congress, London,<br>July 17-24, 1947 |

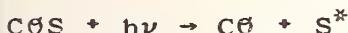
I(a). REACTIONS OF CARBON OXYSULFIDES



Partington and Neville JCSOA-1951-1230



|                          |                                   |
|--------------------------|-----------------------------------|
| Breckenridge, W. H., Jr. | DABBB-1969-30-1063 (mechanism)    |
| Breckenridge and Taube   | JCPSCA-1970-53-1750               |
| Forbes and Cline         | JACSA-1939-61-151 (quantum yield) |
| Fowles, et al.           | JACSA-1967-89-1352 (mechanism)    |
| Jakovleva and Kondratjew | ACPYA-1940-13-241 (mechanism)     |
| Kondratjew, V. N.        | ACPYA-1942-16-272 (mechanism)     |
| McGarvey and McGrath     | PRLAA-1964-278-490 (mechanism)    |
| Sidhu, et al.            | JACSA-1966-88-2412                |
| Strausz and Gunning      | JACSA-1962-84-4080                |



|                          |                                |
|--------------------------|--------------------------------|
| Basco and Pearson        | TFSOA-1967-63-2684 (mechanism) |
| Breckenridge, W. H., Jr. | DABBB-1969-30-1063 (mechanism) |
| Breckenridge and Taube   | JCPSCA-1970-53-1750            |
| Donovan, R. J.           | TFSOA-1969-65-1419 (mechanism) |
| Donovan, et al.          | TFSOA-1970-66-774 (mechanism)  |
| Fair, et al.             | CJCHA-1971-49-1659 (mechanism) |
| Fowles, et al.           | JACSA-1967-89-1352 (mechanism) |
| Gunning and Strausz      | ADPCA-1966-4-143 (mechanism)   |
| Knight, et al.           | JACSA-1963-85-1207 (mechanism) |
| Knight, et al.           | JACSA-1963-85-2349 (mechanism) |
| Knight, et al.           | JACSA-1964-86-4243 (mechanism) |
| Kondrat'ev and Yakovleva | ZETFA-1940-10-1038 (mechanism) |
| Lown, et al.             | JACSA-1967-89-1056             |
| McGrath, et al.          | CJCHA-1967-45-2454             |
| Sidhu, et al.            | JACSA-1966-88-254              |
| Sidhu, et al.            | JACSA-1966-88-2412             |
| Strausz and Gunning      | JACSA-1962-84-4080             |
| Wiebe, et al.            | JACSA-1965-87-1443             |



|                          |                                |
|--------------------------|--------------------------------|
| Kondrat'ev and Yakovleva | ZFKHA-1940-14-853              |
| McGarvey and McGrath     | PRLAA-1964-278-490 (mechanism) |



Thompson, et al. JCSOA-1935-1033



|                        |                            |
|------------------------|----------------------------|
| Hay and Belford        | JCPSCA-1967-47-3944        |
| Partington and Neville | JCSOA-1951-1230            |
| Schecker and Wagner    | IJCKB-1969-1-541           |
| Troe and Wagner        | EBPCA-1967-71-937 (review) |



Sidhu, et al. JACSA-1966-88-2412



Breckenridge and Taube JCPSCA-1970-53-1750



|                     |                                |
|---------------------|--------------------------------|
| Fowles, et al.      | JACSA-1967-89-1352 (mechanism) |
| Gunning and Strausz | ADPCA-1966-4-143 (review)      |



Arnold, et al. TFSOA-1957-53-738 (calculation)

$\text{CO}_2^*$  + M →  $\text{CO}_2$  + M (vibrational relaxation) (Continued)

Cottrell and McCoubrey  
 Eucken and Aybar  
 Fricke, E. F.  
 Herzfeld and Litovitz  
 Knudsen and Fricke  
 McCoubrey, et al.  
 Walker, R. A.

BBOKA-1961-96 (review)  
 ZPCBA-1940-46-195  
 JASMA-1940-12-245  
 BBOKA-1959-250 (review)  
 JASMA-1940-12-255  
 TFSOA-1951-57-1472 (review)  
 JCPSA-1951-19-494 (review)

$\text{CO}_2$  + O → CO + SO

Carrington, et al.  
 Hancock and Smith  
 Homann, et al.  
 Homann, et al.  
 Hoyermann, et al.  
 Rolfs, et al.  
 Sharma, et al.  
 Sharma, et al.  
 Sullivan and Warneck  
 Westenberg, A. A.  
 Westenberg and deHaas  
 Wright, F. J.

PRLAA-1966-293-108 (mechanism)  
 CHPLB-1969-3-573 (mechanism)  
 NACGA-1967-2-13  
 BBPCA-1968-72-998  
 BBPCA-1967-71-603  
 JPCHA-1965-69-849  
 JCPSA-1965-43-2155  
 JPCHA-1967-71-1602  
 BBPCA-1965-69-7  
 SCIEA-1969-164-381 (review)  
 JCPSA-1969-50-707  
 JPCHA-1960-64-1648 (mechanism)

$\text{CO}_2$  + O → CO + SO\* (chemiexcitation)

Carrington, et al.

PRLAA-1966-293-108 (mechanism)

$\text{CO}_2$  + O → CO\* + SO (chemiexcitation)

Pollack, M. A.

APPLA-1966-8-237 (mechanism)

$\text{CO}_2$  + O → CO<sub>2</sub> + S

Arnold and Kimbell  
 Myerson, et al.  
 Wright, F. J.

CHPLB-1969-3-469 (mechanism)  
 JCPSA-1957-26-1309 (mechanism)  
 JPCHA-1960-64-1648 (mechanism)

$\text{CO}_2$  + O → CS + O<sub>2</sub>

Sheen, D. B.

JCPSA-1970-52-648

$\text{CO}_2$  + O + SO → CO<sub>2</sub>\* + SO<sub>2</sub>\* (chemiexcitation)

Melliar-Smith, et al.

JCSIA-1971-606 (mechanism)

$\text{CO}_2$  + O<sub>2</sub> → CO + SO<sub>2</sub>

Bawn, C. E. H.  
 Levy and Merryman  
 Myerson, et al.

JCSOA-1933-145 (mechanism)  
 ESTHA-1969-3-63  
 JCPSA-1957-26-1309 (mechanism)

$\text{CO}_2$  + 2O<sub>2</sub> → CO<sub>2</sub> + O + SO<sub>2</sub>

Bawn, C. E. H.

JCSOA-1933-145 (mechanism)

$\text{CO}_2$  + 3/2O<sub>2</sub> → CO<sub>2</sub> + SO<sub>2</sub> (overall)

Sarkisyan and Nalbandyan DKPCA-1968-178-69 (related paper)  
 Thompson, et al. JCPSA-1933-208

$\text{CO}_2$  + S → CO + S<sub>2</sub>

Basco and Pearson  
 Breckenridge, W. H., Jr.  
 Breckenridge and Taube  
 Fowles, et al.  
 Gunning and Strausz  
 Hay, A. J.

TFSOA-1967-63-2684  
 DABBB-1969-30-1063  
 JCPSA-1970-53-1750  
 JACSA-1967-89-1352 (mechanism)  
 ADPCA-1966-4-143 (mechanism)  
 DABSA-1967-27-2313

$\text{COS} + \text{S} \rightarrow \text{CO} + \text{S}_2$  (Continued)

|                     |                                |
|---------------------|--------------------------------|
| Hay and Belford     | JCP SA-1967-47-3944            |
| Knight, et al.      | JACSA-1963-85-1207 (mechanism) |
| Knight, et al.      | JACSA-1963-85-2349             |
| Knight, et al.      | JACSA-1964-86-4243             |
| Kondratjew, V. N.   | ACPYA-1942-16-272              |
| Schecker and Wagner | IJCKB-1969-1-541               |
| Sidhu, et al.       | JACSA-1966-88-254              |
| Sidhu, et al.       | JACSA-1966-88-2412             |
| Strausz and Gunning | JACSA-1962-84-4080             |
| Wiebe, et al.       | JACSA-1965-87-1443             |

$\text{COS} + \text{S}^* \rightarrow \text{CO} + \text{S}_2$

|                          |                                |
|--------------------------|--------------------------------|
| Breckenridge, W. H., Jr. | DABBB-1969-30-1063             |
| Breckenridge and Taube   | JCP SA-1970-53-1750            |
| Fowles, et al.           | JACSA-1967-89-1352             |
| Gunning and Strausz      | ADPCA-1966-4-143 (review)      |
| Knight, et al.           | JACSA-1963-85-1207 (mechanism) |
| Knight, et al.           | JACSA-1963-85-2349             |
| Knight, et al.           | JACSA-1964-86-4243             |
| Sidhu, et al.            | JACSA-1966-88-254              |
| Sidhu, et al.            | JACSA-1966-88-2412             |
| Strausz and Gunning      | JACSA-1962-84-4080             |
| Wiebe, et al.            | JACSA-1965-87-1443             |

$\text{COS} + \text{S}^* \rightarrow \text{CO} + \text{S}_2^*$

|                   |                                |
|-------------------|--------------------------------|
| Basco and Pearson | TFSOA-1967-63-2684 (mechanism) |
| Donovan, R. J.    | TFSOA-1969-65-1419 (mechanism) |
| Donovan, et al.   | NATUA-1969-222-1164            |
| Donovan, et al.   | TFSOA-1970-66-774              |
| Fair, et al.      | CJCHA-1971-49-1659             |
| Fowles, et al.    | JACSA-1967-89-1352 (mechanism) |
| McGrath, et al.   | CJCHA-1967-45-2454 (mechanism) |

$\text{COS} + \text{S} \rightarrow \text{CS} + \text{SO}$

|                 |                     |
|-----------------|---------------------|
| Hay, A. J.      | DABSA-1967-27-2313  |
| Hay and Belford | JCP SA-1967-47-3944 |

$\text{COS} + \text{S} + \text{M} \rightarrow \text{CO} \text{S}_2 + \text{M}$

|                   |                    |
|-------------------|--------------------|
| Basco and Pearson | TFSOA-1967-63-2684 |
|-------------------|--------------------|

$\text{CO} \text{S} + \text{SO} \rightarrow \text{CO} \text{S}_2 + \text{S}_2$

|                     |                                 |
|---------------------|---------------------------------|
| Halstead and Thrush | PRLAA-1966-295-363 (evaluation) |
|---------------------|---------------------------------|

$\text{CO} \text{S}_2 + \text{M} \rightarrow \text{CO} \text{S} + \text{S} + \text{M}$

|                   |                    |
|-------------------|--------------------|
| Basco and Pearson | TFSOA-1967-63-2684 |
|-------------------|--------------------|

$\text{CO} \text{S}_2 + \text{S} \rightarrow \text{CO} \text{S} + \text{S}_2$

|                   |                    |
|-------------------|--------------------|
| Basco and Pearson | TFSOA-1967-63-2684 |
|-------------------|--------------------|

I(b). REVIEWS

|                        |   |
|------------------------|---|
| Cottrell and McCoubrey | BOOKA-1961-95 (vibrational relaxation)  |
| Gunning and Strausz    | ADPCA-1966-4-143                        |
| Herzfeld and Litovitz  | BOOKA-1959-250 (vibrational relaxation) |
| Sorokin and Fridman    | BOOKA-1970-                             |
| Troe and Wagner        | BBPCA-1967-71-937                       |

II(a). REACTIONS OF CARBON SULFIDES



Partington and Neville

JCSOA-1951-1230



Taylor, G. W.

ACSRA-1971-162-Phys. Chem. 14



Porter, G.

PRLAA-1950-200-284



Kondratjew and Yakovleva ZFKHA-1940-14-853



Callear and Norrish  
Kondratiew, V.  
de Sorgo, et al.

NATUA-1960-188-53 (mechanism)  
CRAUA-1938-20-547  
CJCHA-1965-43-1886 (mechanism)



Callear, A. B.  
Callear and Norrish  
Dyne and Ramsay  
Kondratiew, V.  
Smith, I. W. M.  
Taylor, G. W.

PRLAA-1963-276-401  
NATUA-1960-188-53 (mechanism)  
JCPSA-1952-20-1055  
CRAUA-1938-20-547  
TFSOA-1968-64-3183  
ACSRA-1971-162-Phys. Chem. 14



Hancock and Smith  
Harteck and Reeves  
Homann, et al.  
Jacobson and Kimbell

CHPLB-1969-3-573 (mechanism)  
BSCBA-1962-71-682  
BBPCA-1968-72-998  
JAPIA-1970-41-5210 (mechanism)



Arnold and Kimbell  
Arnold and Kimbell  
Hancock and Smith  
Jeffers and Wiswall  
Suart, et al.  
Suart, et al.  
Wittig, et al.  
Wittig, et al.

APPLA-1969-15-351 (mechanism)  
CHPLB-1969-3-469 (review)  
CHPLB-1969-3-573  
APPLA-1970-17-67  
CHPLB-1970-5-519 (mechanism)  
CHPLB-1970-7-337 (mechanism)  
APPLA-1970-16-117 (mechanism)  
NATUA-1970-226-845 (mechanism)



Wright, F. J.

JPCHA-1960-64-1648



McGarvey and McGrath  
Rosenwaks and Yatsiv  
Sheen, D. B.  
Wood and Heicklen  
Wood and Heicklen

PRLAA-1964-278-490 (mechanism)  
CHPLB-1971-9-266 (mechanism)  
JCPSA-1970-52-648  
JPCHA-1971-75-854 (mechanism)  
JPCHA-1971-75-861



Arnold and Kimbell  
Suart, et al.  
Suart, et al.

APPLA-1969-15-351 (mechanism)  
CHPLB-1970-5-519 (mechanism)  
CHPLB-1970-7-337 (mechanism)

|  |   |
|--|---|
| $\text{CS} + \text{O}_2 \rightarrow \text{CO}_2 + \text{S}$  |   |
| Arnold and Kimbell<br>Wood and Heicklen  | CHPLB-1969-3-469 (review)<br>JPCHA-1971-75-861  |
| $\text{CS}^* + \text{O}_2 \rightarrow \text{CO}_2 + \text{S}$  |   |
| Pollack, M. A.<br>de Sorgo, et al.   | APPLA-1966-8-237 (mechanism)<br>CJCHA-1965-43-1886 (mechanism)  |
| $\text{CS} + \text{O}_3 \rightarrow \text{CO} + \text{SO}_2$   |   |
| Olszyna and Heicklen   | JPCHA-1970-74-4188 (mechanism)  |
| $\text{CS} + \text{O}_3 \rightarrow \text{CO}_2 + \text{SO}$   |   |
| Olszyna and Heicklen   | JPCHA-1970-74-4188 (mechanism)  |
| $\text{CS} + \text{O}_3 \rightarrow \text{CO}_2 + \text{O}_2$  |   |
| Olszyna and Heicklen   | JPCHA-1970-74-4188 (mechanism)  |
| $\text{CS} + \text{SO} \rightarrow \text{CO} + \text{S}_2$   |   |
| Wood and Heicklen  | JPCHA-1971-75-854 (mechanism)   |
| $\text{CS} + \text{SO} \rightarrow \text{CO}^* + \text{S}_2$ (chemiexcitation)   |   |
| Pollack, M. A.<br>Wright, F. J.  | APPLA-1966-8-237 (mechanism)<br>JPCHA-1960-64-1648  |
| $\text{CS} + \text{S}_{2n} \rightarrow \text{CS}_2 + \text{S}_{2n-1}$  |   |
| Breckenridge, W. H., Jr.   | DABBB-1969-30-1063 (mechanism)  |
| $\text{CS}_2^* \rightarrow \text{CS}_2 + h\nu$   |   |
| Douglas, A. E.<br>Heicklen, J.   | JCPSA-1966-45-1007<br>JACSA-1963-85-3562  |
| $\text{CS}_2 + \text{CS}_2^* \rightarrow \text{CS} + \text{CS} + \text{S}_2$   |   |
| de Sorgo, et al.<br>Wood and Heicklen  | CJCHA-1965-43-1886<br>JPCHA-1971-75-854   |
| $\text{CS}_2 + \text{CS}_2 \rightarrow \text{CS} + \text{CS}_3$  |   |
| Arnold, et al.   | JPCHA-1970-74-8   |
| $\text{CS}_2 + h\nu \rightarrow \text{CS} + \text{S}$  |   |
| Basco and Pearson<br>Gregg and Thomas<br>Gunning and Strausz<br>Hancock and Smith<br>Kondrat'ev and Yakovleva<br>McGarvey and McGrath<br>Pollack, M. A.<br>Wright, F. J. | TFSOA-1967-63-2684 (mechanism)<br>JAPIA-1968-39-4399 (mechanism)<br>ADPCA-1966-4-143 (mechanism)<br>CHPLB-1969-3-573 (mechanism)<br>ZFKHA-1940-14-853<br>PRLAA-1964-278-490<br>APPLA-1966-8-237 (mechanism)<br>JPCHA-1960-64-1648 (mechanism) |
| $\text{CS}_2 + h\nu \rightarrow \text{CS} + \text{S}^*$  |   |
| Kondrat'ev and Yakovleva   | ZETFA-1940-10-1038 (mechanism)  |
| $\text{CS}_2 + h\nu \rightarrow \text{CS}^* + \text{S}$  |   |
| Callear, A. B.   | PRLAA-1963-276-401  |



Callear and Norrish  
de Sorgo, et al.

NATUA-1960-188-53 (mechanism)  
CJCHA-1965-43-1886 (mechanism)



Heicklen, J.  
de Sorgo, et al.  
Wood and Heicklen

JACSA-1963-85-3562 (mechanism)  
CJCHA-1965-43-1886 (mechanism)  
JPCHA-1971-75-854



Arnold, et al.  
Arnold and Kimbell  
Arnold and Kimbell  
Gaydon, et al.  
Olszewski, et al.  
Olszewski, et al.  
Troe and Wagner

JPCHA-1970-74-8  
APPLA-1969-15-351 (mechanism)  
JPCHA-1969-73-3751  
PRLAA-1964-279-313 (mechanism)  
ZPCFA-1965-45-329  
BBPCA-1966-70-1060  
BBPCA-1967-71-937 (review)



Taylor, G. W.

ACSRA-1971-162-Phys. Chem. 14



Heicklen, J.  
Wood and Heicklen

JACSA-1963-85-3562  
JPCHA-1971-75-854



Angona, F. A.  
Cottrell and McCoubrey  
Fricke, E. F.  
Gase, et al.  
Gravitt, J. C.  
Herzfeld and Litovitz  
Knudsen and Fricke  
McCoubrey, et al.  
Richards and Reid

JASMA-1953-25-1116  
BØKA-1961-95 (review)  
JASMA-1940-12-245  
ZPCLA-1970-242-107 (calculation)  
JASMA-1960-32-560  
BØKA-1959-250 (review)  
JASMA-1940-12-255  
TFSØA-1961-57-1472 (review)  
JCPSA-1934-2-193



Westbury and Winkler

CJCHA-1960-38-334



Arnold and Kimbell  
Gregg and Thomas  
Pollack, M. A.

CHPLB-1969-3-469 (mechanism)  
JAPIA-1968-39-4399 (mechanism)  
APPLA-1966-8-237 (mechanism)



Arnold and Kimbell  
Callear and Smith  
Hancock and Smith  
Homann, et al.  
McGarvey and McGrath  
Myerson, et al.  
Pollack, M. A.  
Sharma, et al.  
Sheen, D. B.  
Westenberg, A. A.  
Wright, F. J.

CHPLB-1969-3-469 (mechanism)  
NATUA-1967-213-382  
CHPLB-1969-3-573 (review)  
BBPCA-1968-72-998  
PRLAA-1964-278-490 (mechanism)  
JCPSA-1957-26-1309 (mechanism)  
APPLA-1966-8-237 (mechanism)  
JCPSA-1965-43-2155  
JCPSA-1970-52-648  
SCIEA-1969-164-381 (review)  
JPCHA-1960-64-1648 (mechanism)



Arnold and Kimbell  
Arnold and Kimbell  
Callear and Smith  
Hancock and Smith  
Harteck and Reeves  
Homann, et al.  
Jeffers and Wiswall  
Myerson, et al.  
Olszyna and Heicklen  
Rosenwaks and Yatsiv  
Smith, I. W. M.  
Smith, I. W. M.  
Suart, et al.  
Suart, et al.  
Westenberg and deHaas  
Wittig, et al.  
Wittig, et al.  
Wood and Heicklen  
Wood and Heicklen

APPLA-1969-15-351 (mechanism)  
CHPLB-1969-3-469 (mechanism)  
NATUA-1967-213-382  
CHPLB-1969-3-573 (review)  
BSCBA-1962-71-682  
BBPCA-1968-72-998  
APPLA-1970-17-67  
JCPSA-1957-26-1309 (mechanism)  
JPCHA-1970-74-4188  
CHPLB-1971-9-266 (mechanism)  
DFSOA-1967-44-194  
TFSOA-1968-64-378  
CHPLB-1970-5-519 (mechanism)  
CHPLB-1970-7-337 (mechanism)  
JCPSA-1969-50-707  
APPLA-1970-16-117 (mechanism)  
NATUA-1970-226-845 (mechanism)  
JPCHA-1971-75-854  
JPCHA-1971-75-861



Wood and Heicklen

JPCHA-1971-75-854



Azatyan, et al.  
Myerson, et al.  
Taylor and Myerson

DKPCA-1964-158-869 (related paper)  
JCPSA-1957-26-1309 (mechanism)  
SYMCA-1959-7-72 (related paper)



de Sorgo, et al.  
Wood and Heicklen

CJCHA-1965-43-1886  
JPCHA-1971-75-854



Semenoff and Voronkov  
Voronkov and Semenov

ACPYA-1940-12-831 (related paper)  
ZFKHA-1939-13-1695 (related paper)



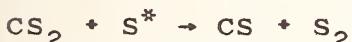
Myerson and Taylor  
Taylor and Myerson  
Thompson, H. W.

JACSA-1953-75-4348  
SYMCA-1959-7-72  
ZPCBA-1930-10-273 (related paper)



Porter, G.  
Wright, F. J.

PRLAA-1950-200-284  
JPCHA-1960-64-1648 (mechanism)



Breckenridge, W. H., Jr. DABBB-1969-30-1063



Basco and Pearson  
Breckenridge, W. H., Jr.

TFSOA-1967-63-2684  
DABRB-1969-30-1063



Wood and Heicklen

JPCHA-1971-75-861



Wright, F. J.

JPCHA-1960-64-1648 (mechanism)



Myerson, et al

JCPSCA-1957-26-1309 (mechanism)

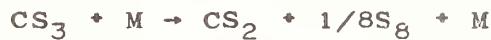


Arnold, et al.

Basco and Pearson

JPCHA-1970-74-8

TFSOA-1967-63-2684



Breckenridge, W. H., Jr. DABBB-1969-30-1063



Basco and Pearson

TFSOA-1967-63-2684

### III(b). REVIEWS

Cottrell and McCoubrey

B60KA-1961-95 (vibrational relaxation)

Gunning and Strausz

ADPCA-1966-4-143

Herzfeld and Litovitz

B60KA-1959-250 (vibrational relaxation)

Troe and Wagner

BBPCA-1967-71-937

III(a). REACTIONS OF SULFUR, SULFUR HYDRIDES AND SULFUR OXIDES



Bauer, et al.

SYMCA-1971-13-417



Bauer, et al.

SYMCA-1971-13-417



Bauer, et al.

SYMCA-1971-13-417



Bauer, et al.

SYMCA-1971-13-417 (mechanism)



Darwent and Roberts

DFSθA-1953-14-55



Yokota, T.

DABSA-1969-29-4136



Burcat, et al.

JCPSA-1968-49-1449



Pyper and Newbury

JCPSA-1970-52-1966



Compton, et al.

JPCHA-1969-73-1158

Cupitt and Glass

TFSθA-1970-66-3007

Darwent and Krasnansky

SYMCA-1959-7-3

Darwent and Roberts

DFSθA-1953-14-55

Darwent and Roberts

PRLAA-1953-216-344 (mechanism)

Darwent, et al.

13DFA-1961-14

Darwent, et al.

JPCHA-1967-71-2346

Dzantiev, et al.

KHVKA-1968-2-571

Forbes, et al.

JACSA-1938-60-1431 (mechanism)

Fowles, et al.

JACSA-1967-89-1352

Gann and Dubrin

JCPSA-1967-47-1867

Kurylo, et al.

JCPSA-1971-54-943

Levy and Merryman

CBFMA-1965-9-229

Liuti, et al.

JACSA-1966-88-3212 (mechanism)

Mihelcic and Schindler

BBPCA-1970-74-1280

Norrish and Zeelenberg

PRLAA-1957-240-293 (related paper)

Perner and Franken

BBPCA-1969-73-897

Stein, N. Θ.

TFSθA-1933-29-583 (mechanism)

Wadlinger and Darwent

JPCHA-1967-71-2057

Woolley and Cvetanovic

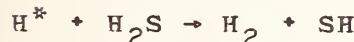
JCPSA-1969-50-4697

Yokota, T.

DABSA-1969-29-4136

Zeelenberg, A. P.

SYMCA-1959-7-68 (related paper)



Yokota, T.

DABSA-1969-29-4136



Dzantiev, et al.

KHVKA-1970-4-361

Dzantiev, et al.

KHVKA-1970-4-545



Halstead and Jenkins



Cupitt and Glass  
Fair and Thrush  
Mayer and Schieler  
Mihelcic and Schindler



Fair and Thrush  
Fenimore and Jones  
Halstead and Jenkins  
Kallend, A. S.  
Kallend, A. S.  
Kallend, A. S.  
Schofield, K.  
Webster and Walsh  
Wheeler, R.



Fenimore and Jones  
Merryman and Levy



Mayer and Schieler



Donovan, et al.



Norrish and Rideal



Aynsley and Robinson  
Aynsley, et al.  
Aynsley, et al.  
Bodenstein, M.  
Norrish and Rideal  
Norrish and Rideal  
Norrish and Rideal  
Porret, D.  
Reinhold, et al.



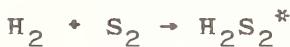
Fowles, et al.  
Gunning and Strausz



Levy and Merryman



Aynsley, et al.  
Porret, D.



Majerik, J. W.

TFSOA-1969-65-3013

TFSOA-1970-66-3007  
TFSOA-1969-65-1557  
JPCHA-1968-72-236 (calculation)  
RBPCA-1970-74-1280

TFSOA-1969-65-1550  
JPCHA-1965-69-3593  
TFSOA-1969-65-3013  
JPCHA-1966-70-2055  
TFSOA-1967-63-2442  
CBFMA-1969-13-324  
PLSSA-1967-15-643  
SYMCA-1965-10-463  
JPCHA-1968-72-3359

JPCHA-1965-69-3593  
SYMCA-1971-13-427

JPCHA-1968-72-236

TFSOA-1970-66-774

JCSOA-1924-125-2070

JCSOA-1935-351  
NATUA-1933-131-471  
JCSOA-1935-58  
ZFPKA-1899-29-315  
JCSOA-1923-123-696  
JCSOA-1923-123-1689  
JCSOA-1924-125-2070  
HCACA-1936-19-680  
ZPCAA-1939-184-273

JACSA-1967-89-1352  
ADPCA-1966-4-143 (mechanism)

CBFMA-1965-9-229

JCSOA-1935-58 (mechanism)  
HCACA-1936-19-680

DABBB-1970-31-555

|   |                                    |
|---|------------------------------------|
| $H_2 + S_6 \rightarrow H_2S + S_5$                        |                                    |
| Porret, D.  | HCACA-1936-19-680                  |
| $H_2S + NO_2 + O_2 + RH + SO_2 \rightarrow \dots$         |                                    |
| Urone, et al.   | ESTHA-1968-2-611                   |
| $H_2S + NO_2 + O_2 + RH + SO_2 + h\nu \rightarrow \dots$  |                                    |
| Urone, et al.   | ESTHA-1968-2-611                   |
| $H_2S + O_2 + SO_2 \rightarrow \dots$                     |                                    |
| Urone, et al.   | ESTHA-1968-2-611                   |
| $H_2S + O_2 + SO_2 + h\nu \rightarrow \dots$              |                                    |
| Urone, et al.   | ESTHA-1968-2-611                   |
| $H_2S + SO + S_2O_2 \rightarrow H_2S + SO_2 + SO_2$       |                                    |
| Emanuel, N. M.  | IANKA-1942-221                     |
| $H_2S + h\nu \rightarrow H + SH$                          |                                    |
| Compton, et al.   | JPCHA-1969-73-1158                 |
| Darwent, B. deB.  | DFSOA-1953-14-123                  |
| Darwent and Krasnansky                                    | SYMCA-1959-7-3 (quantum yield)     |
| Darwent and Roberts                                       | PRLAA-1953-216-344                 |
| Darwent, et al.   | 13DFA-1961-14                      |
| Dzantiev and Shishkov                                     | KHVK-1967-1-192                    |
| Forbes, et al.  | JACSA-1938-60-1431                 |
| Fowles, et al.  | JACSA-1967-89-1352                 |
| McGarvey and McGrath                                      | PRLAA-1964-278-490 (related paper) |
| Majerik, J. W.  | DABRB-1970-31-555 (mechanism)      |
| Norrish and Zeelenberg                                    | PRLAA-1957-240-293 (related paper) |
| Porter, G.  | DFSOA-1953-14-123                  |
| Stein, N. S.  | TFSOA-1933-29-583 (quantum yield)  |
| Wadlinger and Darwent                                     | JPCHA-1967-71-2057                 |
| Zeelenberg, A. P.   | SYMCA-1959-7-68 (related paper)    |
| $H_2S + h\nu \rightarrow H_2 + S$                         |                                    |
| Compton, et al.   | JPCHA-1969-73-1158                 |
| $H_2S + h\nu \rightarrow H_2 + S^*$                       |                                    |
| Stein, N. S.  | TFSOA-1933-29-583 (quantum yield)  |
| $H_2S (+ M) \rightarrow H + SH (+ M)$                     |                                    |
| Levy and Merryman   | CBFMA-1965-9-229                   |
| $H_2S^* (+ M) \rightarrow H + SH (+ M)$                   |                                    |
| Gunning and Strausz                                       | ADPCA-1966-4-143 (mechanism)       |
| $H_2S (+ M) \rightarrow H_2 + 1/2S_2 (+ M)$               |                                    |
| Darwent and Roberts                                       | PRLAA-1953-216-344                 |
| $H_2S^* + M \rightarrow H_2S + M$ (rotational relaxation) |                                    |
| Bauer, et al.   | PHYSA-1970-47-109                  |
| Geide, K.   | ACUSA-1963-13-31                   |



Bauer, et al.  
Shields, F. D.

PHYSA-1970-47-109  
JASMA-1969-45-481



Westbury and Winkler

CJCRA-1960-38-334



Bradley, J. N.  
Bradley and Dobson  
Bradley and Dobson  
Sachyan, et al.  
Sharma, et al.  
Sharma, et al.

TFSOA-1967-63-2945 (mechanism)  
JCPSA-1967-46-2865  
JCPSA-1967-46-2872  
DKPCA-1967-175-647  
JCPSA-1965-43-2155 (mechanism)  
JPCHA-1967-71-1602



Bradley, J. N.  
Bradley and Dobson  
Bradley and Dobson  
Cupitt and Glass  
Hollinden, et al.  
Levy and Merryman  
Liuti, et al.  
Merryman and Levy  
Norrish and Zeelenberg  
Sachyan, et al.  
Takahashi, S.  
Zeelenberg, A. P.

TFSOA-1967-63-2945 (mechanism)  
JCPSA-1967-46-2865  
JCPSA-1967-46-2872  
TFSOA-1970-66-3007  
JPCHA-1970-74-988  
CBFMA-1965-9-229  
JACSA-1966-88-3212  
JPCAA-1967-17-800  
PRLAA-1957-240-293 (related paper)  
DKPCA-1967-175-647  
MDPCA-1970-10-369  
SYMCA-1959-7-68 (related paper)



Bradley, J. N.  
Bradley and Dobson  
Bradley and Dobson  
Levy and Merryman  
Levy and Merryman  
Zeelenberg, A. P.

TFSOA-1967-63-2945 (mechanism)  
JCPSA-1967-46-2865  
JCPSA-1967-46-2872  
CBFMA-1965-9-229  
JEPQA-1965-87-116  
SYMCA-1959-7-68 (related paper)



Levy and Merryman

JEPQA-1965-87-116



Chamberlin and Clarke  
Emanuel, N. M.  
Emanuel, et al.  
Farkas, L.  
Levy and Merryman  
Markovich and Emanuel  
Markovich and Emanuel  
Pavlov, et al.  
Semenov and Emanuel  
Taylor and Livingston  
Thompson, H. W.  
Thompson and Kelland  
Yakovlev and Shantarovich

IECHA-1928-20-1016 (related paper)  
ZFKHA-1940-14-863  
CRAUA-1942-35-250  
CRAUA-1942-36-145  
ACPYA-1944-19-360  
ZFKHA-1945-19-15  
CRAUA-1940-28-618  
ZEELA-1931-37-670  
JEPQA-1963-85-229 (review)  
ZFKHA-1947-21-1251  
ZFKHA-1947-21-1259  
IANKA-1942-98  
CRAUA-1940-28-219  
JPCHA-1931-35-2676  
NATUA-1931-127-629  
JCSOA-1931-1809  
ACPYA-1937-6-71



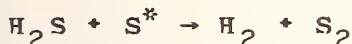
Gregor and Martin

AJCHA-1961-14-462 (related paper)



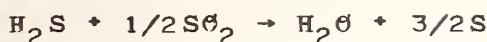
Cadle and Ledford  
Gregor and Martin  
Hales, J. M.  
Hales, et al.

AWP&A-1966-10-25  
AJCHA-1961-14-462 (related paper)  
DABSA-1968-29-985  
ATENB-1969-3-657



Stein, N. G.

TFS&A-1933-29-583 (mechanism)



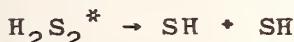
Taylor and Wesley

JPCHA-1927-31-216



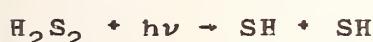
Majerik, J. W.  
Perner and Franken

DABBB-1970-31-555  
BBPCA-1969-73-897



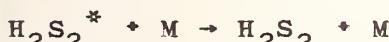
Majerik, J. W.

DABBB-1970-31-555



Strausz, et al.

BBPCA-1968-72-253 (mechanism)



Majerik, J. W.

DABBB-1970-31-555 (mechanism)



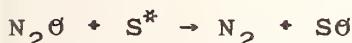
Halstead and Jenkins

TFS&A-1969-65-3013



Liuti, G.

AANLA-1968-45-358



Breckenridge and Taube

JCPSA-1970-53-1750



Bell, et al.  
Reuben, et al.

JCS&A-1955-1440  
SYMCA-1962-8-97



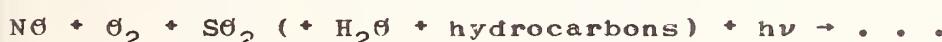
Wilson, et al.

\*APCPZ-1970-70-115 (mechanism)



Tipper and Williams

TFS&A-1961-57-79



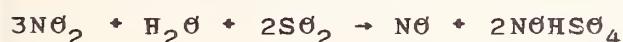
Wilson and Levy

JPCAA-1970-20-385 (mechanism)



Basco and Pearson

TFS&A-1967-63-2684



Stopperka, et al.

ZAACCA-1968-359-14



Clyne, et al.

PRLAA-1966-295-355



Armitage and Cullis  
Boreskov and Ilarionov  
Cullis, et al.  
Kerr, J. A.  
Shaw and Green  
Urone, et al.  
Wilson, et al.

CBFMA-1971-16-125  
ZFKHA-1940-14-1428  
PRLAA-1966-295-72  
CSAAA-1967-64-73 (review)  
NATUA-1966-211-1171  
ESTHA-1968-2-611 (related paper)  
APCPZ-1970-70-115 (mechanism)



Ripperton, et al.  
Ripperton, et al.  
Tipper and Williams  
Wilson and Levy

ACSRA-1965-150-19.X  
ACSRA-1964-147-20.R  
TFSOA-1961-57-79  
JPCAA-1970-20-385



Wilson, et al.

\*APCPZ-1970-70-115 (mechanism)



Cullis, et al.

PRLAA-1966-295-72



Basco and Pearson

TFSOA-1967-63-2684



Tewarson and Palmer

SYMCA-1971-13-99 (mechanism)



Fair and Thrush

TFSOA-1969-65-1557



Cupitt and Glass  
Liuti, et al.  
Takahashi, S.

TFSOA-1970-66-3007  
JACSA-1966-88-3212 (mechanism)  
MDPCA-1970-10-369



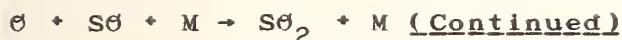
Cohen and Gross  
Fletcher and Levitt  
Gaydon, A. G.  
Harteck and Reeves  
Herman, et al.  
Liuti, G.  
Reeves and Emerson  
Rolfes, et al.  
Sharma, et al.  
Sharma, et al.  
Takahashi, S.  
Williams, D. J.  
Zeelenberg, A. P.

JCPSA-1969-50-3119  
TFSOA-1969-65-1544  
PRLAA-1934-146-901 (mechanism)  
BSCBA-1962-71-682  
JOSRA-1962-2-215 (mechanism)  
AANLA-1968-45-358 (mechanism)  
JCPSA-1970-52-2161 (mechanism)  
JPCHA-1965-69-849  
JCPSA-1965-43-2155 (mechanism)  
JPCHA-1967-71-1602  
MDPCA-1970-10-369  
CBFMA-1968-12-165  
SYMCA-1959-7-68 (mechanism)



Bauer, S. H.  
Gaydon, A. G.  
Gaydon, et al.  
Halstead and Thrush  
Halstead and Thrush  
Kerr, J. A.

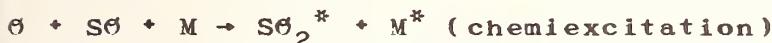
ARPLA-1965-16-245 (review)  
PRLAA-1934-146-901 (mechanism)  
PRLAA-1963-276-461 (mechanism)  
PHCBA-1965-4-1007  
PRLAA-1966-295-363  
CSAAA-1967-64-73 (review)



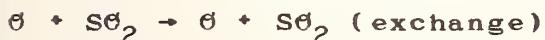
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|-----------------------|------------------------------------|
| McGarvey and McGrath  | PRLAA-1964-278-490 (related paper) |
| Norrish and Oldershaw | PRLAA-1959-249-498 (related paper) |
| Sharma, et al.        | JPCHA-1967-71-1602                 |
| Takahashi, S.         | MDPCA-1970-10-369                  |
| Zeelenberg, A. P.     | SYMCA-1959-7-68 (related paper)    |



|                        |   |
|------------------------|---|
| Bradley and Dobson     | JCPSA-1967-47-1555                      |
| Fletcher and Levitt    | TFS $\Theta$ A-1969-65-1544 (mechanism) |
| Halstead and Thrush    | NATUA-1964-204-992 (mechanism)          |
| Halstead and Thrush    | PRLAA-1966-295-363                      |
| McGarvey and McGrath   | PRLAA-1964-278-490 (related paper)      |
| Melliar-Smith, et al.  | JCSIA-1971-606 (mechanism)              |
| Norrish and Zeelenberg | PRLAA-1957-240-293 (related paper)      |
| Rolfes, et al.         | JPCHA-1965-69-849 (mechanism)           |
| Takahashi, S.          | MDPCA-1970-10-369                       |



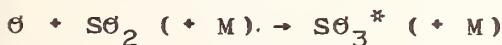
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|-----------------------|----------------------------|
| Melliar-Smith, et al. | JCSIA-1971-606 (mechanism) |
|-----------------------|----------------------------|



|               |                    |
|---------------|--------------------|
| Clark, et al. | JCPSA-1970-52-4692 |
|---------------|--------------------|



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|--------------------------|--|
| Baldwin, R. R.           | SYMCA-1965-10-470                          |
| Bell, et al.             | JCS $\Theta$ A-1955-1440                   |
| Cadle and Powers         | TELLA-1966-18-176                          |
| Dooley and Whittingham   | TFS $\Theta$ A-1946-42-354 (related paper) |
| Driscoll and Warneck     | JPCHA-1968-72-3736                         |
| Fenimore and Jones       | JPCHA-1965-69-3593                         |
| Halstead and Thrush      | PHCBA-1965-4-1007                          |
| Halstead and Thrush      | PRLAA-1966-295-363                         |
| Hedley, A. B.            | FUSJA-1962-13-45                           |
| Hedley, A. B.            | *PICFZ-1963-204                            |
| Jakovleva and Kondratjew | ACPYA-1940-13-241 (mechanism)              |
| Kaufman, F.              | PRLAA-1958-247-123                         |
| Levy and Merryman        | CBFMA-1965-9-229                           |
| Levy and Merryman        | JEP $\Theta$ A-1963-85-229 (review)        |
| Levy and Merryman        | JEP $\Theta$ A-1965-87-116                 |
| Levy and Merryman        | JEP $\Theta$ A-1965-87-374                 |
| Merryman and Levy        | SYMCA-1971-13-427                          |
| Mulcahy, et al.          | SYMCA-1969-12-323                          |
| Mulcahy, et al.          | JPCHA-1967-71-2124                         |
| Myerson, et al.          | JCPSA-1957-26-1309 (mechanism)             |
| Nettleton and Stirling   | SYMCA-1969-12-635                          |
| Reuben, et al.           | SYMCA-1962-8-97                            |
| Schofield, K.            | PLSSA-1967-15-643                          |
| Sullivan, et al.         | NASCA-1961-N62-15918                       |
| Thrush, B. A.            | SYMCA-1965-10-470                          |
| Tipper and Williams      | TFS $\Theta$ A-1960-56-1805                |
| Walsh, A. D.             | SYMCA-1965-10-470                          |
| Webster and Walsh        | SYMCA-1965-10-463                          |
| Whittingham, G.          | 18MNA-1947-4-591 (related paper)           |
| Whittingham, G.          | SYMCA-1949-3-453 (related paper)           |



|                     |   |
|---------------------|---|
| Jaffe and Klein     | TFS $\Theta$ A-1966-62-2150             |
| Tipper and Williams | TFS $\Theta$ A-1960-56-1805 (mechanism) |



|                    |                    |
|--------------------|--------------------|
| Fenimore and Jones | JPCHA-1965-69-3593 |
|--------------------|--------------------|



|   |                                    |
|---|------------------------------------|
| Merryman and Levy   | SYMCA-1971-13-427                  |
| Nettleton and Stirling  | SYMCA-1969-12-635                  |
| Norrish and Oldershaw   | PRLAA-1959-249-498 (related paper) |
| $\Theta + S_2 \rightarrow \Theta + S\Theta$                         |                                    |
| Homann, et al.  | BBPCA-1968-72-998                  |
| $\Theta H + \Theta H + S\Theta_2 \rightarrow H_2\Theta + S\Theta_3$ |                                    |
| McAndrew and Wheeler  | JPCHA-1962-66-229                  |
| $\Theta H + S\Theta \rightarrow H + S\Theta_2$                      |                                    |
| Cupitt and Glass  | TFSOA-1970-66-3007                 |
| Fair and Thrush   | TFSOA-1969-65-1557                 |
| $\Theta H + SH \rightarrow H_2 + S\Theta$                           |                                    |
| Zeelenberg, A. P.   | SYMCA-1959-7-68 (mechanism)        |
| $\Theta_2 + S \rightarrow \Theta + S\Theta$                         |                                    |
| Cupitt and Glass  | TFSOA-1970-66-3007                 |
| Davis and Pilling   | ACSRA-1971-162-Phys. Chem. 6       |
| Fair and Thrush   | TFSOA-1969-65-1557                 |
| Fair, et al.  | CJCHA-1971-49-1659                 |
| Gregg and Thomas  | JAPIA-1968-39-4399 (mechanism)     |
| Hancock and Smith   | CHPLB-1969-3-573 (mechanism)       |
| Harteck and Reeves  | BSCBA-1962-71-682                  |
| Homann, et al.  | BBPCA-1968-72-998                  |
| Homann, et al.  | BBPCA-1969-73-967                  |
| McGarvey and McGrath  | PRLAA-1964-278-490 (related paper) |
| Myerson, et al.   | JCPSA-1957-26-1309 (mechanism)     |
| Pollack, M. A.  | APPLA-1966-8-237 (mechanism)       |
| Wittig, et al.  | NATUA-1970-226-845 (mechanism)     |
| Wright, F. J.   | JPCHA-1960-64-1648 (mechanism)     |
| $\Theta_2 + S \rightarrow S\Theta_2 + S\Theta_3$ (overall)          |                                    |
| Semenoff and Rjabinin   | ZPCBA-1928-1-192 (related paper)   |
| $\Theta_2 + S + M \rightarrow S\Theta_2 + M$                        |                                    |
| Norrish and Rideal  | JCSOA-1923-123-1689                |
| Norrish and Rideal  | JCSOA-1923-123-3202                |
| $\Theta_2 + S^* + M \rightarrow S\Theta_2 + M$                      |                                    |
| Kondrat'ev and Yakovleva  | ZETFA-1940-10-1038 (mechanism)     |
| $\Theta_2 + SH \rightarrow \Theta H + S\Theta$                      |                                    |
| Bradley, J. N.  | TFSOA-1967-63-2945 (mechanism)     |
| Bradley and Dobson  | JCPSA-1967-46-2865                 |
| Bradley and Dobson  | JCPSA-1967-46-2872                 |
| McGarvey and McGrath  | PRLAA-1964-278-490 (related paper) |
| Norrish and Zeelenberg  | PFLAA-1957-240-293 (related paper) |
| Zeelenberg, A. P.   | SYMCA-1959-7-68 (related paper)    |
| $\Theta_2 + S\Theta (+ M) \rightarrow \Theta + S\Theta_2 (+ M)$     |                                    |
| Bradley, J. N.  | TFSOA-1967-63-2945 (review)        |
| Bradley and Dobson  | JCPSA-1967-46-2865                 |
| Bradley and Dobson  | JCPSA-1967-46-2872                 |
| Driscoll and Warneck  | JPCHA-1968-72-3736                 |
| Harteck and Reeves  | BSCBA-1962-71-682                  |
| Homann, et al.  | BBPCA-1968-72-998                  |

$\theta_2 + S\theta_2 (+ M) \rightarrow \theta + S\theta_2 (+ M)$  (Continued)

Homann, et al.  
 Levy and Merryman  
 Levy and Merryman  
 McGarvey and McGrath  
 Merryman and Levy  
 Myerson and Taylor  
 Norrish and Oldershaw  
 Norrish and Zeelenberg  
 Sachyan, et al.  
 Sheen, D. B.  
 Williams, D. J.  
 Wood and Heicklen  
 Zeelenberg, A. P.

EBPCA-1969-73-967  
 CBFMA-1965-9-229  
 JEP $\theta$ A-1965-87-374  
 PRLAA-1964-278-490 (related paper)  
 JPCAA-1967-17-800  
 JCPSA-1957-26-1309 (mechanism)  
 PRLAA-1959-249-498 (related paper)  
 PRLAA-1957-240-293 (related paper)  
 DKPCA-1967-175-647 (mechanism)  
 JCPSA-1970-52-648  
 CBFMA-1968-12-165  
 JPCHA-1971-75-861  
 SYMCA-1959-7-68 (related paper)

 $1/2\theta_2 + S\theta_2 (+ M) \rightarrow S\theta_2 (+ M)$ 

Gaydon, et al.  
 Levy and Merryman

PRLAA-1963-276-461  
 JEP $\theta$ A-1965-87-116

 $\theta_2 + S\theta + M \rightarrow S\theta_3 + M$ 

Driscoll and Warneck  
 Levy and Merryman  
 Levy and Merryman  
 Myerson, et al.  
 Norrish and Oldershaw  
 Wood and Heicklen  
 Wood and Heicklen

JPCHA-1968-72-3736  
 CBFMA-1965-9-229  
 JEP $\theta$ A-1965-87-374  
 JCPSA-1957-26-1309 (mechanism)  
 PRLAA-1959-249-498 (related paper)  
 JPCHA-1971-75-854  
 JPCHA-1971-75-861

 $\theta_2 + S\theta_2^* \rightarrow \theta + S\theta_3$ 

Driscoll and Warneck

JPCHA-1968-72-3736

 $\theta_2 + S\theta_2^* \rightarrow S\theta_4$ 

Blacet, F. E.  
 Dunham, S. B.  
 Gerhard and Johnstone  
 Katz and Gale  
 Shirai, et al.

IECHA-1952-44-1339 (mechanism)  
 NATUA-1960-188-51 (mechanism)  
 IECHA-1955-47-972  
 \*IUAPZ-1970-CP-1E  
 KGKZA-1962-65-1906 (mechanism)

 $1/2\theta_2 + S\theta_2 + h\nu \rightarrow S\theta_3$  (overall)

Arin, et al.  
 Chen, S. W.  
 Coehn, A.  
 Coehn and Becker  
 Cox and Penkett  
 Kornfeld and Weegman  
 Shirai, et al.  
 Sullivan, et al.

\*GCABZ-1969-RPT/GCA-TR-69-12-G  
 HHHPA-1958-24-187  
 ZEELA-1907-13-545  
 ZEPCA-1910-70-88  
 ATENB-1970-4-341  
 ZEELA-1930-36-789  
 KGKZA-1962-65-1906  
 NASCA-1961-RPT/GCA-TR-61-17-N

 $\theta_2 + S\theta_2 + M \rightarrow \dots$ 

Cullis, et al.  
 Urone, et al.

CBFMA-1967-11-150  
 ESTHA-1968-2-611 (related paper)

 $1/2\theta_2 + S\theta_2 + M \rightarrow S\theta_3 + M$ 

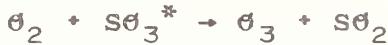
Cox and Penkett  
 Cullis, et al.  
 Levy and Merryman  
 Levy and Merryman  
 Merryman and Levy  
 Nikolov, et al.

ATENB-1970-4-341  
 PRLAA-1966-295-72  
 JEP $\theta$ A-1963-85-229 (review)  
 JEP $\theta$ A-1965-87-116  
 SYMCA-1971-13-427  
 JAPUA-1970-43-2340



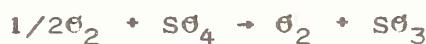
Katz and Gale

\*IUAPZ-1970-CP-1 E



Tipper and Williams

TFS $\Theta$ A-1960-56-1805 (mechanism)



Katz and Gale

\*IUAPZ-1970-CP-1 E



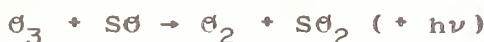
Blacet, F. E.  
Dunham, S. B.  
Shirai, et al.

IECHA-1952-44-1339 (mechanism)  
NATUA-1960-188-51 (mechanism)  
KGKZA-1962-65-1906 (mechanism)



Kondratjew, V. N.

ACPYA-1942-16-272 (mechanism)



Halstead and Thrush  
Halstead and Thrush  
Halstead and Thrush  
Halstead and Thrush  
Homann, et al.  
McKenzie and Thrush  
Mettee, H. D.  
Alszyna and Heicklen  
Schofield, K.  
Thrush, B. A.  
Thrush, et al.

NATUA-1964-204-992  
CC $\Theta$ MA-1965-213  
PHCBA-1965-4-1007  
PRLAA-1966-295-380 (mechanism)  
BBPCA-1969-73-967  
PRLAA-1968-308-133  
JACSA-1968-90-2972  
JPCHA-1970-74-4188 (mechanism)  
PLSSA-1967-15-643  
CHMBA-1966-2-287  
JPCHA-1968-72-3711



Halstead and Thrush  
Halstead and Thrush  
Halstead and Thrush  
Mettee, H. D.  
Schofield, K.  
Thrush, B. A.  
Thrush, et al.

CC $\Theta$ MA-1965-213  
PHCBA-1965-4-1007  
PRLAA-1966-295-380  
JACSA-1968-90-2972  
PLSSA-1967-15-643  
CHMBA-1966-2-287  
JPCHA-1968-72-3711



Wilson and Levy  
Wilson, et al.

JPCAA-1970-20-385  
\*APCPZ-1970-70-115 (mechanism)



Ripperton, et al.

ACSPRA-1964-147-20.R



Good and Thynne  
Good and Thynne

TFS $\Theta$ A-1967-63-2708  
TFS $\Theta$ A-1967-63-2720



Badcock, et al.  
Dainton and Ivin  
Sidebottom, et al.  
Timmons, R. B.

JACSA-1971-93-3115  
TFS $\Theta$ A-1950-46-374  
JACSA-1971-93-3121  
PHCBA-1970-12-219



Good and Thynne  
Good and Thynne

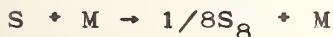
TFS\theta A-1967-63-2708  
TFS\theta A-1967-63-2720



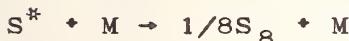
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|--------------------------|--------------------------------|
| Breckenridge, W. H., Jr. | DABBB-1969-30-1063             |
| Breckenridge and Taube   | JCP SA-1970-53-1750            |
| Donovan, R. J.           | TFS\theta A-1969-65-1419       |
| Donovan, et al.          | NATUA-1969-222-1164            |
| Donovan, et al.          | TFS\theta A-1970-66-774        |
| Fair, et al.             | CJCHA-1971-49-1659             |
| Knight, et al.           | JACSA-1963-85-2349             |
| Knight, et al.           | JACSA-1964-86-4243             |
| Lown, et al.             | JACSA-1967-89-1056             |
| McGrath, et al.          | CJCHA-1967-45-2454 (mechanism) |



|                     |                                |
|---------------------|--------------------------------|
| Fowles, et al.      | JACSA-1967-89-1352 (mechanism) |
| Gunning and Strausz | ADPCA-1966-4-143 (mechanism)   |
| Sidhu, et al.       | JACSA-1966-88-254              |



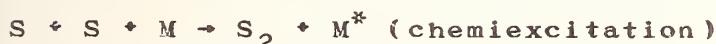
Breckenridge and Taube      JCP SA-1970-53-1750



Breckenridge and Taube      JCP SA-1970-53-1750



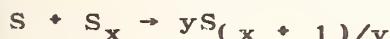
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|--------------------|---------------------------------------|
| Bodenstein, M.     | ZEPCA-1899-29-315 (mechanism)         |
| Callear, A. B.     | PRLAA-1963-276-401                    |
| Fowles, et al.     | JACSA-1967-89-1352                    |
| Knight, et al.     | JACSA-1963-85-1207 (mechanism)        |
| Knight, et al.     | JACSA-1963-85-2349 (mechanism)        |
| Knight, et al.     | JACSA-1964-86-4243 (mechanism)        |
| Norrish and Rideal | JCS\theta A-1923-123-1689 (mechanism) |
| Porret, D.         | HCACA-1936-19-680 (mechanism)         |
| Porter, G.         | DFS\theta A-1953-14-123 (mechanism)   |



Tewarson and Palmer      SYMCA-1971-13-99 (mechanism)



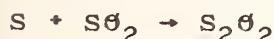
Fair and Thrush      DFS\theta A-1967-44-236  
Fair and Thrush      TFS\theta A-1969-65-1208  
Tewarson and Palmer      SYMCA-1971-13-99 (mechanism)



Aynsley, et al.      JCS\theta A-1935-58 (mechanism)



Fair and Thrush      TFS\theta A-1969-65-1557  
Mihelcic and Schindler      BBPCA-1970-74-1280



Jakovleva and Kondratjew      ACPYA-1940-13-241 (mechanism)  
Kondratjew, V. N.      ACPYA-1942-16-272 (mechanism)



Fowles, et al.



Darwent, B. deB.  
Darwent and Roberts  
Darwent, et al.  
Dzantiev and Shishkov  
Fair and Thrush  
Fowles, et al.  
Gunning and Strausz  
Mihelcic and Schindler  
Norrish and Zeelenberg  
Perner and Franken  
Porter, G.  
Stein, N. Ø.  
Strausz, et al.

JACSA-1967-89-1352 (mechanism)

DFSGA-1953-14-123 (mechanism)  
PRLAA-1953-216-344  
JPCHA-1967-71-2346 (mechanism)  
KHKVA-1967-1-192  
TFSGA-1969-65-1557  
JACSA-1967-89-1352  
ADPCA-1966-4-143 (mechanism)  
BBPCA-1970-74-1280  
PPLAA-1957-240-293 (related paper)  
BBPCA-1969-73-897  
DFSGA-1953-14-123 (mechanism)  
TFSGA-1933-29-583 (mechanism)  
BBPCA-1968-72-253



Strausz, et al.



Darwent, B. deB.  
Darwent and Roberts  
Darwent, et al.  
Dzantiev and Shishkov  
Fair and Thrush  
Forbes, et al.  
Fowles, et al.  
Mihelcic and Schindler  
Porter, G.  
Strausz, et al.

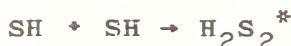
BBPCA-1968-72-253

DFSGA-1953-14-123 (mechanism)  
PRLAA-1953-216-344  
JPCHA-1967-71-2346 (mechanism)  
KHKVA-1967-1-192  
TFSGA-1969-65-1557  
JACSA-1938-60-1431 (mechanism)  
JACSA-1967-89-1352  
BBPCA-1970-74-1280  
DFSGA-1953-14-123 (mechanism)  
BBPCA-1968-72-253



Forbes, et al.  
Fowles, et al.

JACSA-1938-60-1431 (mechanism)  
JACSA-1967-89-1352



Majerik, J. W.  
Perner and Franken

DABBB-1970-31-555  
BBPCA-1969-73-897 (calculation)



Kornfeld and McCaig  
Wieland, K.

TFSMA-1934-30-991 (mechanism)  
TFSGA-1934-30-260 (mechanism)



Breckenridge and Miller  
Carrington, et al.

ACRSA-1971-162-Phys. Chem. 87  
TFSGA-1966-62-2994



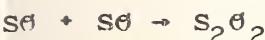
Tewarson and Palmer

SYMCA-1971-13-99 (mechanism)



Donovan, et al.  
Halstead and Thrush  
Halstead and Thrush  
Hoyermann, et al.  
Sullivan and Warneck  
Tewarson and Palmer

TFSGA-1969-65-2930  
PHCBA-1965-4-1007  
PRLAA-1966-295-363  
BBPCA-1967-71-603  
BBPCA-1965-69-7  
SYMCA-1971-13-99 (mechanism)



Jakovleva and Kondratjew ACPYA-1940-13-241 (mechanism)  
Markovich and Emanuel ZFKHA-1947-21-1251 (mechanism)  
Norrish and Oldershaw PRLAA-1959-249-498 (related paper)  
Norrish and Zeelenberg PRLAA-1957-240-293 (related paper)  
Zeelenberg, A. P. SYMCA-1959-7-68 (related paper)



Bauer, et al.  
Kornfeld and McCaig

SYMCA-1971-13-417 (mechanism)  
TFSθA-1934-30-991 (mechanism)



Halstead and Thrush  
Norrish and Oldershaw

PHCBA-1965-4-1007  
PRLAA-1959-249-498 (related paper)



Driscoll and Warneck

JPCHA-1968-72-3736



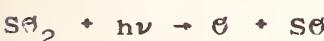
Driscoll and Warneck

JPCHA-1968-72-3736



Badcock, et al.  
Bradley and Dobson  
Caton and Duncan  
Collier, et al.  
Douglas, A. E.  
Fletcher and Levitt  
Gerlovin and Grlova  
Greenough and Duncan  
Halstead and Thrush  
Halstead and Thrush  
Halstead and Thrush  
LeReton, et al.  
Levitt and Sheen  
Levitt and Sheen  
McKenzie and Thrush  
Mettee, H. D.  
Mettee, H. D.  
Norrish and Zeelenberg  
Okuda, et al.  
Otsuka and Calvert  
Rao and Calvert  
Rao, et al.  
Rao, et al.  
Reeves and Emerson  
Rolfes, et al.  
Sidebottom, et al.  
Sidebottom, et al.  
Strickler and Howell  
Thrush, B. A.  
Timmons, R. B.

JACSA-1971-93-3115  
JCPSA-1967-47-1555  
JACSA-1968-90-1945  
JACSA-1970-92-217  
JCPSA-1966-45-1007  
TFSθA-1969-65-1544 (mechanism)  
GPSUA-1964-16-9  
JACSA-1961-83-555  
PHCBA-1965-4-1007  
PRLAA-1966-295-363 (mechanism)  
PRLAA-1966-295-380  
JCPSA-1971-55-2940  
JCPSA-1964-41-584  
TFSθA-1967-63-540  
PRLAA-1968-308-133  
JACSA-1968-90-2972  
JCPSA-1968-49-1784  
PRLAA-1957-240-293 (related paper)  
JPCHA-1969-73-4412 (mechanism)  
JACSA-1971-93-2581  
JPCHA-1970-74-681  
JACSA-1969-91-1609  
JACSA-1969-91-1616  
JCPSA-1970-52-2161  
JPCHA-1965-69-849 (mechanism)  
JACSA-1971-93-2587  
JACSA-1971-93-3121  
JCPSA-1968-49-1947  
CHMBA-1966-2-287  
PHCBA-1970-12-219 (mechanism)



Driscoll and Warneck  
Herman, et al.  
Jakovleva and Kondratjew  
Kornfeld and McCaig  
Norrish and Oldershaw  
Sullivan, et al.  
Wieland, K.

JPCHA-1968-72-3736  
JQSRA-1962-2-215 (mechanism)  
ACPYA-1940-13-241  
TFSθA-1934-30-991 (mechanism)  
PRLAA-1959-249-498 (related paper)  
NASCA-1961-N62-15918 (mechanism)  
TFSθA-1934-30-260 (mechanism)



Driscoll and Warneck  
Sullivan, et al.



Keck and Kalelkar  
Levitt and Sheen  
Olschewski, et al.  
Troe and Wagner

JPCHA-1968-72-3736  
NASCA-1961-N62-15918 (mechanism)



Levitt and Sheen

\*AVEVZ-1968-289 (calculation)  
TFSOA-1967-63-2955  
ZPCFA-1965-44-173  
BPPCA-1967-71-937



Gaydon, et al.  
LeBreton, et al.

PRLAA-1963-276-461  
JCPSA-1971-55-2940



Badcock, et al.  
O'Brien and Myers

JACSA-1971-93-3115  
JCPSA-1970-53-3832



Tewarson and Palmer

SYMCA-1971-13-99 (mechanism)



Badcock, et al.  
Collier, et al.  
Dainton and Ivin  
Dainton and Ivin  
Driscoll and Warneck  
Fletcher and Levitt  
Greenough and Duncan  
Halstead and Thrush  
Halstead and Thrush  
Jackson and Calvert  
Levitt and Sheen  
Levitt and Sheen  
McKenzie and Thrush  
Mettee, H. D.  
Mettee, H. D.  
Okuda, et al.  
Olschewski, et al.  
Otsuka and Calvert  
Rao and Calvert  
Rao, et al.  
Rao, et al.  
Rolfes, et al.  
Shirai, et al.  
Sidebottom, et al.  
Sidebottom, et al.  
Strickler and Howell  
Thrush, B. A.  
Timmons, R. B.

JACSA-1971-93-3115  
JACSA-1970-92-217  
TFSOA-1950-46-374  
TFSOA-1950-46-382  
JPCHA-1968-72-3736  
TFSOA-1969-65-1544 (mechanism)  
JACSA-1961-83-555  
PHCBA-1965-4-1007  
PRLAA-1966-295-363 (mechanism)  
PRLAA-1966-295-380  
JACSA-1971-93-2593  
JCPSA-1964-41-584  
TFSOA-1967-63-540  
PRLAA-1968-308-133  
JCPSA-1968-49-1784  
JPCHA-1969-73-1071  
JPCHA-1969-73-4412  
ZPCFA-1965-44-173  
JACSA-1971-93-2581  
JPCHA-1970-74-681  
JACSA-1969-91-1609  
JACSA-1969-91-1616  
JPCHA-1965-69-849 (mechanism)  
KGKZA-1962-65-1906 (mechanism)  
JACSA-1971-93-2587  
JACSA-1971-93-3121  
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CHMBA-1966-2-287  
PHCBA-1970-12-219

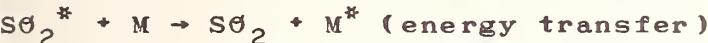


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Bauer, et al.  
Cottrell and McCoubrey

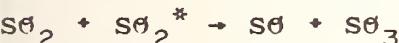
JCPSA-1971-54-644  
SYMCA-1971-13-417  
BOKKA-1961-97 (review)



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| Dickens and Linnett   | PRLAA-1957-243-84 (calculation) |
| Fricke, E. F.         | JASMA-1940-12-245               |
| Grossmann, E.         | ANPYA-1932-13-681               |
| Herzfeld and Litovitz | BØØKA-1959-253 (review)         |
| Kneser, H. Ø.         | ANPYA-1933-16-337               |
| Lambert and Salter    | PRLAA-1958-243-78               |
| McCoubrey, et al.     | PRLAA-1961-264-299              |
| Petralia, S.          | NUCIA-1952-9-818                |
| Richards and Reid     | JCPSA-1934-2-193                |
| Schweikert, G.        | ANPYA-1915-48-593               |
| Shields, F. D.        | JCPSA-1967-46-1063              |
| Shields and Anderson  | JCPSA-1971-55-2636              |



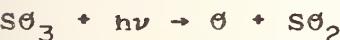
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| Levitt and Sheen   | TFSOA-1965-61-2404 |
| Rao, et al.        | JACSA-1969-91-1609 |
| Sidebottom, et al. | JACSA-1971-93-2587 |



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| Badcock, et al.          | JACSA-1971-93-3115               |
| Driscoll and Warneck     | JPCHA-1968-72-3736               |
| Gaydon, et al.           | PRLAA-1963-276-461               |
| Jackson and Calvert      | JACSA-1971-93-2593               |
| Jakovleva and Kondratjew | ACPYA-1940-13-241                |
| Økuda, et al.            | JPCHA-1969-73-4412               |
| Ølschewski, et al.       | ZPCFA-1965-44-173                |
| Øtsuka and Calvert       | JACSA-1971-93-2581               |
| Sidebottom, et al.       | JACSA-1971-93-2587               |
| Sullivan, et al.         | NASCA-1961-N62-15918 (mechanism) |



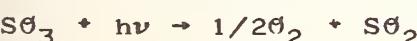
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| Shirai, et al. | KGKZA-1962-65-1906 (mechanism) |
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| Norrish and Oldershaw | PRLAA-1959-249-498 (related paper) |
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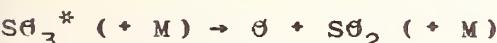
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| Norrish and Oldershaw | PRLAA-1959-249-498 |
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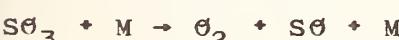
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| Coehn, A.        | ZEELA-1907-13-545 |
| Coehn and Becker | ZEPCA-1910-70-88  |



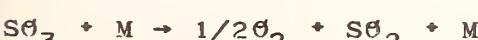
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| Nettleton and Stirling | SYMCA-1969-12-635 |
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| Jaffe and Klein | TFSOA-1966-62-2150 |
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| Gaydon, et al. | PRLAA-1963-276-461 (mechanism) |
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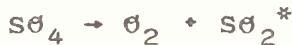


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| Hedley, A. B.                  | FUSJA-1962-13-45   |
| Hedley, A. B.                  | *PICFZ-1963-204    |
| Levy and Merryman              | JEPØA-1965-87-116  |
| Vitukhnovskaya and Belyanskaya | JAPUA-1960-33-2397 |



Jaffe and Klein  
Tipper and Williams

TFSOA-1966-62-2150  
TFSOA-1960-56-1805 (mechanism)



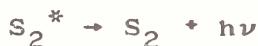
Katz and Gale

\*IUAPZ-1970-CP-1E



Bodenstein, M.  
Breckenridge and Taube  
Gunning and Strausz  
Knight, et al.  
Knight, et al.  
Knight, et al.  
Porret, D.  
Porter, G.  
Strausz and Gunning  
Wright, F. J.

ZEPCA-1899-29-315 (mechanism)  
JCPSA-1970-53-1750  
ADPCA-1966-4-143 (mechanism)  
JACSA-1963-85-1207 (mechanism)  
JACSA-1963-85-2349 (mechanism)  
JACSA-1964-86-4243 (mechanism)  
HCACA-1936-19-680 (mechanism)  
PRLAA-1950-200-284  
JACSA-1962-84-4080  
JPCHA-1960-64-1648



Durand, E.  
Fair and Thrush  
Fair and Thrush

JCPSA-1940-8-46  
DFSOA-1967-44-236  
TFSOA-1969-65-1208



Bodenstein, M.  
Norrish and Rideal

ZEPCA-1899-29-315 (mechanism)  
JCSOA-1923-123-1689 (mechanism)



Basco and Pearson  
Donovan, et al.  
Fair and Thrush  
Fair and Thrush

TFSOA-1967-63-2684  
NATUA-1969-222-1164  
DFSOA-1967-44-236  
TFSOA-1969-65-1208



Durand, E.

JCPSA-1940-8-46



Fowles, et al.  
Tewarson and Palmer

JACSA-1967-89-1352  
SYMCA-1971-13-99 (mechanism)



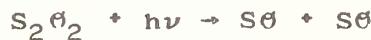
Callear, A. B.  
Fowles, et al.  
Majerik, J. W.  
Norrish and Rideal  
Norrish and Rideal

PRLAA-1963-276-401  
JACSA-1967-89-1352  
DABBB-1970-31-555  
JCSOA-1923-123-1689 (mechanism)  
JCSOA-1923-123-3202 (mechanism)



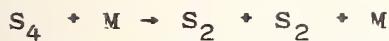
Myerson, et al.

JCPSA-1957-26-1309 (mechanism)



Zeelenberg, A. P.

SYMCA-1959-7-68 (related paper)



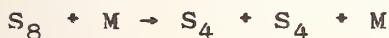
Norrish and Rideal  
Norrish and Rideal

JCSOA-1923-123-1689 (mechanism)  
JCSOA-1923-123-3202 (mechanism)



Norrish and Rideal  
Norrish and Rideal

JCSOA-1923-123-1689 (mechanism)  
JCSOA-1923-123-3202 (mechanism)



Norrish and Rideal  
Norrish and Rideal

JCSOA-1923-123-1689 (mechanism)  
JCSOA-1923-123-3202 (mechanism)

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Bufalini, M. ESTHA-1971-5-685

Cottrell and McCoubrey B66KA-1961-97

Gunning and Strausz ADPCA-1966-4-143

Herzfeld and Litovitz BC6KA-1959-253



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| 15. SUPPLEMENTARY NOTES   |  |   |  |                                 |
| 16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)<br><br>A bibliography, a reaction oriented list of references, is provided for published papers and reports containing rate data for reactions of COS, COS <sub>2</sub> , CS, CS <sub>2</sub> , CS <sub>3</sub> , D <sub>2</sub> S, H <sub>2</sub> S, H <sub>2</sub> <sup>2</sup> , HSO <sub>2</sub> , S, SH, SO, SO <sub>2</sub> , SO <sub>3</sub> , SO <sub>4</sub> , S <sub>2</sub> , S <sub>2</sub> O <sub>2</sub> , S <sub>4</sub> , S <sub>6</sub> and S <sub>8</sub> with each other and with CO, CO <sub>2</sub> , D, D <sub>2</sub> , H, H <sub>2</sub> , H <sub>2</sub> O, N, N <sub>2</sub> , N <sub>2</sub> O, N <sub>2</sub> O <sub>5</sub> , NO, NO <sub>2</sub> , NO <sub>3</sub> , NOS, O, OH, O <sub>2</sub> , O <sub>3</sub> , R and RH. Three lists of critical reviews dealing with the above reactions are included. 317 papers covering 240 reactions are listed. The period covered extends from 1899 through June 1971. |  |   |  |                                 |
| 17. KEY WORDS (Alphabetical order, separated by semicolons)<br>Bibliography; carbon oxysulfides; carbon sulfides; chemical kinetics; gas phase; hydrogen; nitrogen; nitrogen oxides; oxygen; sulfur; sulfur hydrides; sulfur oxides.  |  |   |  |                                 |
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