

Stereoselective Synthesis

... from the Science of Synthesis Reference Library

Editorial Guidelines

Volume Editors J. G. de Vries
 P. A. Evans
 G. A. Molander

Managing Editor M.F. Shortt de Hernandez



2009
Georg Thieme Verlag KG
Stuttgart · New York

This reference work mentions numerous commercial and proprietary trade names, registered trademarks and the like (not necessarily marked as such), patents, production and manufacturing procedures, registered designs, and designations. The editors and publishers wish to point out very clearly that the present legal situation in respect of these names or designations or trademarks must be carefully examined before making any commercial use of the same. Industrially produced apparatus and equipment are included to a necessarily restricted extent only and any exclusion of products not mentioned in this reference work does not imply that any such selection of exclusion has been based on quality criteria or quality considerations.

Warning! Read carefully the following: Although this reference work has been written by experts, the user must be advised that the handling of chemicals, microorganisms, and chemical apparatus carries potentially life-threatening risks. For example, serious dangers could occur through quantities being incorrectly given. The authors took the utmost care that the quantities and experimental details described herein reflected the current state of the art of science when the work was published. However, the authors, editors, and publishers take no responsibility as to the correctness of the content. Further, scientific knowledge is constantly changing. As new information becomes available, the user must consult it. Although the authors, publishers, and editors took great care in publishing this work, it is possible that typographical errors exist, including errors in the formulas given herein. Therefore, **it is imperative that and the responsibility of every user to carefully check whether quantities, experimental details, or other information given herein are correct based on the user's own understanding as a scientist.** Scale-up of experimental procedures published in *Science of Synthesis* carries additional risks. In cases of doubt, the user is strongly advised to seek the opinion of an expert in the field, the publishers, the editors, or the authors. When using the information described herein, the user is ultimately responsible for his or her own actions, as well as the actions of subordinates and assistants, and the consequences arising therefrom.

Date of publication: ■ 2009 – 1st edition

Copyright and all related rights reserved, especially the right of copying and distribution, multiplication and reproduction, as well as of translation. No part of this publication may be reproduced by any process, whether by photostat or microfilm or any other procedure, without previous written consent by the publisher. This also includes the use of electronic media of data processing on reproduction of any kind.

© 2009 Georg Thieme Verlag KG
Rüdigerstrasse 14
D-70469 Stuttgart

Printed in Germany

Typesetting: Ziegler + Müller, Kirchentellinsfurt (APP, V.9.1 M020)
Printing and Binding: ■

Preface

Science of Synthesis

Science of Synthesis, Houben–Weyl Methods of Molecular Transformations was launched in 2000 and is edited by D. Bellus (Basel, Switzerland), E. N. Jacobsen (Cambridge, USA), S. V. Ley (Cambridge, UK), R. Noyori (Nagoya, Japan), M. Regitz (Kaiserslautern, Germany), P. J. Reider (Princeton, USA), E. Schaumann (Clausthal-Zellerfeld, Germany), I. Shinkai (Tokyo, Japan), E. J. Thomas (Manchester, UK), and B. M. Trost (Stanford, USA). *Science of Synthesis* is a balanced and critical reference work produced by the collaborative efforts of chemists, from both industry and academia, selected by the Editorial Board. All published results from journals, books, and patent literature from the early 1800s until the year of publication are considered by the authors, who are among the leading experts in their field, to provide chemists with the most reliable methods to solve their synthesis problems.

Science of Synthesis is organized in a logical hierarchical system based on the target molecule to be synthesized. The critical coverage of methods is supported by information intended to help the user choose the most suitable method for their application, thus providing a strong foundation from which to develop a successful synthetic route. Within each category of product, illuminating background information such as history, nomenclature, structure, stability, reactivity, properties, safety, and environmental aspects are discussed along with a detailed selection of reliable methods. Each method and variation is accompanied by reaction schemes, tables of examples, experimental procedures, and a background discussion of mechanistic rationale, stereochemistry, scope of the reaction described and its limitations, and functional group compatibility. In a format consisting of 48 volumes, *Science of Synthesis* is a unique reference work, selecting and evaluating all synthetic methodology and thus providing more than just a compound database or an indiscriminate review of the literature.

To best meet the needs of the scientific community, *Science of Synthesis* is being published as an electronic version and also in print.

Science of Synthesis Knowledge Updates

From 2009 onwards, the organic chemistry reference series *Science of Synthesis* will be continuously updated with high-quality content using clearly defined criteria for method selection as well as established editorial processes. The Editorial Board, in conjunction with selected volume editors and authors, will review the whole field of synthetic organic chemistry as presented in *Science of Synthesis* and evaluate significant developments in synthetic methodology.

The series will be edited by E. M. Carreira (Zurich, Switzerland), C. P. Decicco (Princeton, USA), A. Fuerstner (Muelheim, Germany), G. A. Molander (Pennsylvania, USA), P. J. Reider (Princeton, USA), E. Schaumann (Clausthal-Zellerfeld, Germany), M. Shibasaki (Tokyo, Japan), E. J. Thomas (Manchester, UK), and B. M. Trost (Stanford, USA).

A list of strict criteria for method selection will guide the updating process in order to guarantee that only the best and most reliable synthetic methods are included in *Science of Synthesis*. Authors involved in the updating process will add new methods and add new (or completely revise existing) product (sub)classes.

The updating procedure will be continuous and new content will be added to the electronic version in four releases per year. *Science of Synthesis* will continue to be the most up-to-date evaluated electronic reference work available, emphasizing the most significant developments in synthetic methodology.

Science of Synthesis will give convenient access to a century of synthetic organic chemistry starting with the first volume of *Houben–Weyl* published in 1909 right through to groundbreaking methodology added immediately upon validation by experts. The electronic version's intuitive interface will adapt in keeping with the latest technological developments and will enable chemists worldwide in both academia and industry to solve complex synthetic problems.

Science of Synthesis Reference Library

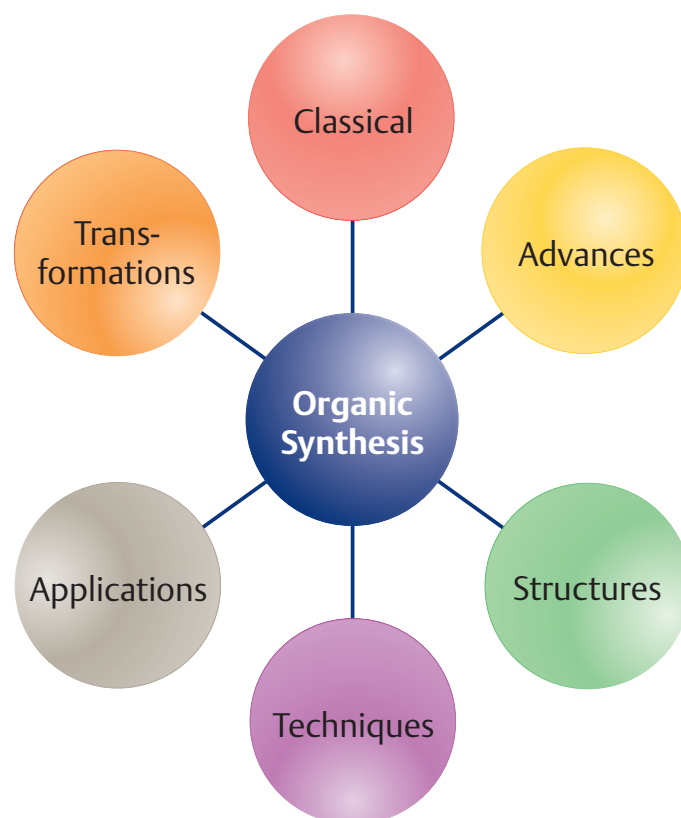
From 2010 onwards, the organic chemistry reference series *Science of Synthesis* will be complemented by a variety of organic synthesis specialist topic reference works which will encompass the *Science of Synthesis Reference Library*. A modular approach will be used to build the reference library using six main classifications: 1) Classical, 2) Advances, 3) Transformations, 4) Applications, 5) Structures, and 6) Techniques.

Science of Synthesis is organized by product topology (1D). The *Science of Synthesis Reference Library* will be designed so that where possible it incorporates reaction type. This additional content will be complementary to the existing scaffold of core synthetic methodology available and will provide a “2D” approach in terms of product design.

The *Science of Synthesis Reference Library* will be developed in collaboration with Members of the *Science of Synthesis* Editorial Board who will help with the identification and selection of topics as well as provide guidance in relation to the scientific content and format of presentation of the product. World renowned experts will be chosen to author the contributions. The high editorial quality standards associated with *Science of Synthesis* will be maintained and the product will be made available in both print and online formats.

The Publisher

Science of Synthesis Reference Library – A Modular Structure



Stereoselective Synthesis Publication Schedule and Modules

Stereoselective Synthesis	Publi- cation	Classical	Advances	Transfor- mations	Applica- tions	Struc- tures	Tech- niques
Stereoselective Synthesis: Reactions of Carbon-Carbon Double Bonds	2010			✓			
Stereoselective Synthesis: Reactions of Carbonyl and Imine Groups	2010			✓			
Stereoselective Synthesis: Cross-Coupling, Pericyclic Reactions, C–H/C–X Activation	2010		✓	✓			
Stereoselective Synthesis: General Concepts (and Future Perspectives?)	2011	✓					
Stereoselective Synthesis: Total Synthesis of Natural Products	2011	✓			✓	✓	
Stereoselective Synthesis: Analytical Methods (Enantiomeric Purity)	2011						✓

Stereoselective Synthesis – An Insight

Editorial Description

As the pace of chemical research accelerates, the need for reference works also increases, but individual volumes need to be lean, timely, up to date, readily available, and focus on the high-impact chemistry that is shaping the future of the science. The *Science of Synthesis* Reference Library is designed to fill this need. To achieve the speed required and still provide an authoritative coverage of topical areas, (1) the volume editor of each individual volume is a leader in the field, (2) each volume is designed modularly, presenting a self-consistent overview of a specific topic, (3) the authors make a critical selection of the most significant work reported in a given area, (4) the publishing house keeps a tight production schedule to guarantee timely publication. The goal for each volume is two years from start to publication.

Stereoselective Synthesis is the first set in the *Science of Synthesis* Reference Library. A major global challenge to chemistry in the 21st Century is the development of more efficient and environmentally friendly methods for the preparation of chiral compounds. Chiral organic molecules are essential for modern medicine and in many other areas that serve the basis for our welfare.

Stereoselective Synthesis is a major reference work that critically reviews the status of the field and serves as the foundation for future research to solve the many challenges that still lie ahead. In the tradition of the classical *Houben–Weyl E21*, *Stereoselective Synthesis*, which covered mainly stoichiometric methods up to the early 90s, the new *Stereoselective Synthesis* presents the state of the art, including catalytic methods and presenting overviews by experts in the field. Typical or general experimental procedures for the best methods are included.

Stereoselective Synthesis is published in book and electronic form. The latter is based on and coupled to the *Science of Synthesis* online electronic version and makes use of the latest developments in information technology. It is equipped with a powerful and user-friendly information retrieval system to allow for substructure, exact structure, and reaction searches.

The organization of *Stereoselective Synthesis* is based on synthetic methods, which are arranged according to the type of reaction. This differs from and complements the organization of *Science of Synthesis*, which is based on product structure. Each chapter covers a specific methodology, so that the hierarchy of the work is kept as flat as possible.

It is not the aim of this work to comprehensively present all synthetic methods; a selection has been made by the editors of those methods that are most significant for modern stereoselective synthesis. For a comprehensive treatment of all synthetic methods, *Science of Synthesis*, *Houben–Weyl Methods of Molecular Transformations* is recommended. Likewise, the examples given for each method will be selected by the authors to illustrate the scope and limitations of the method in question. It is beyond the scope of any modern reference work to present an exhaustive coverage of all examples of any given method; indeed, the value added of all volumes in the *Science of Synthesis* Reference Library is the critical and authoritative selection of the most significant methods from the vast sea of the chemical literature.

The efforts to find the perfect chemical reactions that meet the stringent requirements for a sustainable global society are still in their infancy. The aim of *Stereoselective Synthesis* is to help further that process.

The Publisher

Table of Contents

1	<i>Stereoselective Synthesis</i>	11
1.1	Introduction	11
1.2	Objectives and Scope	11
1.3	Selection Criteria	12
1.4	Requirements for Final Manuscript Submission	13
1.4.1	Text Folder	13
1.4.2	Graphics Folder	14
1.5	Terminology to be Used in <i>Stereoselective Synthesis</i>	14
2	People	19
2.1	Roles of the Participants	19
2.1.1	The Volume Editors	19
2.1.2	The Authors	19
2.1.3	The Editorial Office	20
2.2	The Participants	21
2.2.1	The Volume Editors	21
2.2.2	Thieme Chemistry: Editorial, Sales, Marketing, and Software Development	22
3	Manuscript Preparation	23
3.1	General Criteria	23
3.2	Disposition of the Manuscript	23
3.3	Guidelines for Text	23
3.3.1	Format of Text	23
3.3.2	Style of the Manuscripts	24
3.3.3	Nomenclature	24
3.3.4	Units	24
3.3.5	Abbreviations	24
3.3.6	Experimental Procedures	25
3.3.6.1	Example Experimental Procedure	25
3.3.7	Safety	26
3.3.8	Copyright	27
3.4	Guidelines for References and Cross-References	27
3.4.1	Sample References	28
3.5	Guidelines for Tables and Scheme Tables	28
3.6	Guidelines for Schemes	30
3.7	Guidelines for Figures	31

10	Table of Contents	
3.8	Delivery of the Manuscripts	32
3.8.1	Table of Contents	32
3.8.2	Submission of Final Manuscript	32
3.8.3	Copyediting Process	32
3.8.4	Page Proofs	32
3.9	Use of the Document Template	33
3.10	Frequently Asked Questions	33
4	Appendix	36
4.1	Chemical and General Abbreviations used in <i>Stereoselective Synthesis</i>	36
4.2	Journal Abbreviations	42

1 **Stereoselective Synthesis**

1.1 **Introduction**

The **title, subject and scope** of the assigned contribution are to be clarified with the volume editor.

Table of Contents. In order to minimize overlap and duplication of information within the contributions please submit a table of contents to the volume editor with a copy to the Editorial Office (an e-mail is sufficient: science-of-synthesis@thieme.de).

Coverage. The aim of *Stereoselective Synthesis* is to provide the readers with a critical review of the methodology chosen and to present the contribution in an informative and readable style.

1. Authors should not exceed the number of pages agreed upon in the Contributing Author's Agreement and should try to be as concise as possible in their coverage of a particular subject area. However, should an amendment to the number of pages agreed upon be unavoidable because significant new results are available then the responsible volume editor must be informed immediately. A decision can then be made between the volume editor and Publishing House about the best way to proceed.
2. Where possible cross-references to methodology described in *Science of Synthesis* and *Houben-Weyl E 21 (Stereoselective Synthesis)* should be included.
3. Also, to further help coordinate activities, authors will be sent a complete list of contributors and section numbers for the volumes in the series to help with cross-referencing within the *Stereoselective Synthesis* volumes themselves.

Language. All parts of *Stereoselective Synthesis* will be written in American English. All parts of the manuscript should be written in the *present* or *relevant* tense, except for the *experimental procedures*, which should be written in the *past tense*. For further details on the style of the manuscripts please see Section 3.3.2.

Sample Contributions. Two sample contributions will be prepared and sent to all authors to help as a guide regarding the styles and conventions used in *Stereoselective Synthesis*. Any queries with regard to these sample contributions should be addressed to one of the volume editors.

1.2 **Objectives and Scope**

Stereoselective Synthesis is a three-volume work to be published by Thieme Chemistry in 2010. The organization of *Stereoselective Synthesis* is based on synthetic methods, which are arranged according to the type of reaction. Each contribution covers a specific methodology, so that the hierarchy of the work is kept as flat as possible. Each contribution is thematically homogeneous, and the contribution authors are the acknowledged experts on the topic in question.

A typical contribution in *Stereoselective Synthesis* would take the following format (for the purpose of the electronic product there should be a maximum of five hierarchical levels):

1. Reaction to be Described, e.g. Hydrosilylation of Carbon–Carbon Double Bonds
2. Introductory Text
 - Background Information (e.g., history, nomenclature, applications)
 - Robustness
 - Scalability
 - Safety and Environmental Aspects
 - Yield
 - Scheme/s
3. Mechanism
 - Background Information
 - Scheme/s
4. Method/s
 - Background information (e.g., history)
 - Stereochemistry
 - Scope
 - Limitations and Problems
 - Scheme/s
 - Table of Examples
 - Experimental Procedures
5. References

Imperative to the success of the project is the quality of the contribution submitted by the author and the attempt to critically review all methods and rank them.

Articles written in the style of monographs or textbooks do not comply with the requirements of *Stereoselective Synthesis*. The manuscript must be written according to the organizational principles as explained in the Editorial Guidelines for *Stereoselective Synthesis*.

1.3 Selection Criteria

- *Stereoselective Synthesis* is exclusively oriented toward synthesis and the selection of the best and most reliable synthetic procedures. All synthetic methodology reported should be checked for the synthetic importance of the synthesized compound, the ease of execution, the yield of reaction, the cost of the reaction, green issues, and also whether there are easier methods available for the synthesis of a certain compound.
- A reaction can be of high mechanistic and theoretical interest, but this is not a sufficient criterion for inclusion in *Stereoselective Synthesis*.
- A synthetic method may be very interesting from the point of view of the mechanism, but if there is an easier and less expensive alternative then only this will be reported. The interesting alternative may or may not be mentioned.
- Authors are encouraged to report synthetic methods which would typically have been successfully applied to six different compounds i.e. good yields. Methods that have only been reported for two or three compounds with varying yields need to be further evaluated.
- For all methods, references to the pertinent literature should be given. Important references to a particular procedure should also be given and reference to other tertiary reference works (i.e., from competitors) should be avoided.

1.4 Requirements for Final Manuscript Submission

The final manuscript as approved by the volume editor should be submitted to the Editorial Office by e-mail to: science-of-synthesis@thieme.de.

The manuscript should take the following format:

1.4.1 Text Folder

This folder should contain an MS Word file of the manuscript.

- **Title Page** [including author(s), full postal address(es) of the author(s), e-mail address(es) of the author(s)]
- **Table of Contents**
- **Abstract** consisting of 10–15 lines summarizing the content
- **Keywords** i.e. 1–3 per page
- List of **Abbreviations and Symbols** used
- **Body text** with places for insertion of schemes, figures, and tables clearly labeled. All pages should be numbered with Arabic numerals.
- **References** should be placed collectively at the end of the text and should be numbered consecutively within chapters, with no subdivisions such as ^[3a], ^[3b], ^[3c], etc. Each reference number should contain only one citation. For further guidelines on the presentation and format of references please see Section 3 (Manuscript Preparation).

General: Compound numbers should only be used if the compound is referred to in the text. Where the full name of a compound is given the compound number should appear emboldened in parentheses. If the full name isn't given then the number simply appears in bold, no parentheses.

Not all structures need to have a compound number. Only products of experimental procedures *must* have a compound number. All compound numbers should be referred to somewhere in the text. Where the full name of a compound is given, the compound number should appear in bold and in parentheses. If the full name is not given then the number simply appears in bold with no parentheses.

Abbreviations should not be used in the running text (e.g., CO should read carbon monoxide). Abbreviations should only be used in the experimental sections (and in schemes and tables).

Schemes and figures should not be electronically embedded in the text. They should be indicated in the text using Arabic numerals as follows:

<Figure1> This is a Sample Figure

<Scheme 1> This is a Sample Scheme

Scheme: A graphic containing chemical structures (not only chemical reactions).

Figure: A graphic containing pictorial information such as chemical apparatus or an NMR spectrum.

1.4.2 Graphics Folder

General: Broken bar and solid bars are to be used to specify absolute configuration. Please do not use wedged bonds!

This folder should have multiple chemical drawing files (preferably ChemDraw) which contain figures and schemes that are to be inserted into the body of the text. For details on the appearance of figures and schemes as well as the *Stereoselective Synthesis* ChemDraw settings please see Section 3 (Manuscript Preparation).

If necessary, please contact the Editorial Office (science-of-synthesis@thieme.de) for a copy of the *Science of Synthesis* ChemDraw template.

A **graphic abstract**, visually summarizing the contents of the contribution with a chemical equation or illustration, will be used to allow browsing in the electronic version. Please do not forget to include this abstract and identify it clearly.

1.5 Terminology to be Used in *Stereoselective Synthesis*

Glossary (selected from IUPAC Recommendations 1996: <http://www.chem.qmul.ac.uk/iupac/stereo/>)

Absolute Configuration – The spatial arrangement of the atoms of a chiral molecular entity (or group) and its stereochemical description e.g. R or S. See also relative configuration and α (alpha), β (beta).

Achiral – See *chirality*.

Achirotopic – See *chirotopic*.

Chiral – Having the property of *chirality*.

Chirality – The geometric property of a rigid object (or spatial arrangement of points or atoms) of being non-superposable on its mirror image; such an object has no symmetry elements of the second kind (a mirror plane, $\sigma = S_1$, a centre of inversion, $i = S_2$, a rotation-reflection axis, S_{2n}). If the object is superposable on its mirror image the object is described as being achiral.

Chirality Sense – The property that distinguishes enantiomorphs. The specification of two enantiomorphs by reference to an oriented space e.g. of a screw, a right threaded one or a left threaded one. The expression ‘opposite chirality’ is short for ‘opposite chirality sense’.

Chirotopic – The description of an atom (or point, group, face, etc. in a molecular model) that resides within a *chiral* environment. One that resides within an achiral environment has been called achirotopic.

CIP Priority – In the CIP rules the conventional order of ligands established for the purpose of unambiguous designation of *stereoisomers*. It is deduced by application of sequence rules, the authoritative statement of which appears in R. S. Cahn, C. K. Ingold and V. Prelog, *Angew. Chem.* **78**, 413–447 (1966), *Angew. Chem. Int. Ed. Eng.* **5**, 385–415, 511 (1966); and V. Prelog and G. Helmchen, *Angew. Chem.* **94**, 614–631 (1982), *Angew. Chem. Int. Ed. Eng.* **21**, 567–583 (1982).

cis/trans-Isomers – Descriptors which show the relationship between two ligands attached to separate atoms that are connected by a double bond or are contained in a ring. The two ligands are said to be located *cis* to each other if they lie on the same side of a plane. If they are on opposite sides, their relative position is described as *trans*. The appropriate reference plane of a double bond is perpendicular to that of the relevant σ -bonds and passes through the double bond. For a ring (the ring being in a conformation, real or assumed, without re-entrant angles at the two substituted atoms) it is the mean plane of the ring(s). For alkenes the terms *cis* and *trans* may be ambiguous and have therefore largely been replaced by the *E, Z* convention for the nomenclature of organic compounds. If there are more than two entities attached to the ring the use of *cis* and *trans* requires the definition of a reference substituent (See IUPAC, *Nomenclature of Organic Chemistry, Sections A, B, C, D, E, F and H*, Pergamon Press, 1979, p. 478, Rule E-2.3.3, E-2.3.4; IUPAC, *A Guide to IUPAC Nomenclature of Organic Chemistry*, Blackwell Scientific Publications, 1993, pp. 149–151, Rule R-7.1.1).

Configuration – In the context of stereochemistry, the term is restricted to the arrangements of atoms of a molecular entity in space that distinguishes *stereoisomers*, the *isomerism* between which is not due to *conformation* differences. See also *absolute configuration*; *relative configuration*.

Conformation – The spatial arrangement of the atoms affording distinction between stereoisomers which can be interconverted by rotations about formally single bonds.

Constitution – The description of the identity and connectivity (and corresponding bond multiplicities) of the atoms in a molecular entity (omitting any distinction arising from their spatial arrangement).

Desymmetrisation – The modification of an object which results in the loss of one or more symmetry elements, such as those which preclude *chirality* (mirror plane, centre of inversion, rotation-reflection axis), as in the conversion of a *prochiral* molecular entity into a chiral one.

Diastereoisomerism – *Stereoisomerism* other than *enantiomerism*. Diastereoisomers (or diastereomers) are stereoisomers not related as mirror images. Diastereoisomers are characterised by differences in physical properties, and by some differences in chemical behaviour towards achiral as well as chiral reagents.

Diastereoisomers – See *diastereoisomerism*.

Diastereomorphism – The relationship between objects (or models) analogous to that between *diastereoisomeric* molecular entities.

Diastereotopic – Constitutionally equivalent atoms or groups of a molecule which are not symmetry related. Replacement of one of two diastereotopic atoms or groups results in the formation of one of a pair of *diastereoisomers*.

E/Z – The approved *stereodescriptors* of stereoisomeric alkenes $R^1R^2C=CR^3R^4$ ($R^1 \neq R^2$, $R^3 \neq R^4$; neither R^1 nor R^2 need be different from R^3 or R^4), cumulenes $R^1R^2C=C=C=C_n=CR^3R^4$ and related systems e.g. $R^1R^2C=NOH$, $HON=C\{[CH_2]_n\}_2C=NOH$. The group of highest *CIP priority* attached to one of the terminal doubly bonded atoms of the alkene, oxime, etc. or cumulene (i.e., R^1 or R^2) is compared with the group of highest precedence attached to the other (i.e., R^3 or R^4). The stereoisomer is designated as *Z* (*zusammen* = together) if the groups lie on the same side of a reference plane passing through the double bond and per-

pendicular to the plane containing the bonds linking the groups to the double-bonded atoms; the other stereoisomer is designated as *E* (*entgegen* = opposite). The descriptors may be applied to structures with a fractional bond order between one and two; and to double bonds involving elements other than carbon. They are not used to describe ring substitution relationships. See also *cis-trans* isomers.

Enantiomer – One of a pair of molecular entities which are mirror images of each other and non-superposable.

Enantiomerism – The isomerism of *enantiomers*.

Enantiomorph – One of a pair of *chiral* objects or models that are non-superposable mirror images of each other. The adjective *enantiomorph* is also applied to mirror-image related groups within a molecular entity.

Enantiotopic – Constitutionally identical atoms or groups in molecules which are related by symmetry elements of the second kind only (mirror plane, inversion centre or rotation-reflection axis). For example the two groups *c* in a grouping *Cabcc* are enantiotopic. Replacement of one of a pair of enantiotopic groups forms one of a pair of enantiomers. Analogously, if complexation or addition to one of the two faces defined by a double bond or other molecular plane gives rise to a chiral species, the two faces are called enantiotopic. See also *prochiral*; *diastereotopic*.

Isomer – One of several chemical species (or molecular entities) that have the same stoichiometric molecular formula but different constitutional formulae or different *stereochemical formulae* and hence potentially different physical and/or chemical properties.

Isomerism – The relationship between *isomers*.

meso-Compound – A term for the achiral member(s) of a set of *diastereoisomers* which also includes one or more chiral members.

Prochirality – This term is used in different, sometimes contradictory ways; four are listed below.

1. The geometric property of an achiral object (or spatial arrangement of points or atoms) which is capable of becoming *chiral* in a single *desymmetrisation* step. An achiral molecular entity, or a part of it considered on its own, is thus called prochiral if it can be made chiral by the replacement of an existing atom (or achiral group) by a different one.
An achiral object which is capable of becoming chiral in two desymmetrisation steps is sometimes described as *proprochiral*.
2. The term prochirality also applies to an achiral molecule or entity which contains a trigonal system and which can be made chiral by the addition to the trigonal system of a new atom or achiral group.
3. The term prochiral also applies to a tetrahedral atom of an achiral or chiral molecule which is bonded to two stereoheterotopic groups.
4. The term prochirality is also applied to the enantiotopic faces of a trigonal system.

Pseudoasymmetric Carbon Atom – The traditional name for a tetrahedrally coordinated carbon atom bonded to four different entities, two and only two of which have the same constitution but opposite chirality sense.

Relative Configuration –

1. The configuration of any stereogenic (asymmetric) centre with respect to any other stereogenic centre contained within the same molecular entity. Unlike absolute configuration, relative configuration is reflection-invariant. Relative configuration, distinguishing diastereoisomers, may be denoted by the configurational descriptors R^* , R^* (or l) and R^* , S^* (or u) meaning, respectively, that the two centres have identical or opposite configurations. For molecules with more than two asymmetric centres the prefix rel- may be used in front of the name of one enantiomer where R and S have been used. If any centres have known absolute configuration then only R^* and S^* can be used for the relative configuration. See also (alpha), (beta) (1) and (3).
2. Two different molecules $Xabcd$ and $Xabce$, may be said to have the same relative configurations if e takes the position of d in the tetrahedral arrangement of ligands around X (i.e. the pyramidal fragments $Xabc$ are superposable). By the same token the enantiomer of $Xabce$ may be said to have the opposite relative configuration to $Xabcd$. The terms may be applied to chiral molecular entities with central atoms other than carbon but are limited to cases where the two related molecules differ in a single ligand.

Both definitions can be generalised to include stereogenic units other than asymmetric centres.

Stereochemical Formula – A three-dimensional view of a molecule either as such or in a projection.

Stereochemistry – this noun should be used to describe the entire field rather than a specific aspect.

Stereodescriptors – A prefix to specify configuration (absolute or relative) or conformation. For example R,S ; r,s ; P,M ; Re,Si ; E,Z ; ap,sp ; etc.

Stereogenic Unit – A grouping within a molecular entity that may be considered a focus of stereoisomerism. At least one of these must be present in every enantiomer (though the presence of stereogenic units does not conversely require the corresponding chemical species to be chiral). Three basic types are recognised for molecular entities involving atoms having not more than four substituents:

1. A grouping of atoms consisting of a central atom and distinguishable ligands, such that the interchange of any two of the substituents leads to a stereoisomer. An asymmetric atom (chirality centre) is the traditional example of this stereogenic unit.
2. A chain of four non-coplanar atoms (or rigid groups) in a stable conformation, such that an imaginary or real (restricted) rotation (with a change of sign of the torsion angle) about the central bond leads to a stereoisomer.
3. A grouping of atoms consisting of a double bond with substituents which give rise to cis-trans isomerism.

Stereoisomerism – Isomerism due to differences in the spatial arrangement of atoms without any differences in connectivity or bond multiplicity between the isomers.

Stereoisomers – Isomers that possess identical constitution, but which differ in the arrangement of their atoms in space. See enantiomer, diastereoisomer, cis-trans isomers.

Superposability – The ability to bring two particular stereochemical formulae (or models) into coincidence (or to be exactly superposable in space, and for the corresponding mo-

lecular entities or objects to become exact replicas of each other) by no more than translation and rigid rotation.

Superposable – See superposability.

2 People

2.1 Roles of the Participants

2.1.1 The Volume Editors

The tasks of the volume editors include:

- consulting duties and strategic planning;
- preparation of a complete concept for the *Stereoselective Synthesis* project;
- approval of the basic concept of the *Stereoselective Synthesis* project;
- participation at any Volume Editor Meetings organized by the publisher;
- the recruitment of authors (contributing authors) for the individual volumes;
- coordination and monitoring of the deadlines;
- the monitoring of the manuscripts, illustrations, and artwork received, in particular for their suitability, scientific content, completeness, and conformance to the publisher's guidelines and the requirements of the contract;
- indicating any necessary changes, additions, or abridgments of the manuscripts, illustrations, and artwork, if the contributing authors are not willing or able to do so;
- giving the Imprimatur for each part of the volume;
- informing the publisher regularly (at least quarterly, and also at any time at the publisher's request) comprehensively about the state of the volume/contributions;
- assisting the publisher in marketing and promotion activities.

2.1.2 The Authors

The tasks of the authors include:

- adhering to the specifications contained in the Editorial Guidelines. The contributing author shall furthermore take into consideration the recommendations and ideas of the volume editors and of the publisher with regard to editorial, stylistic, and professional aspects;
- writing the contribution in such a way that it corresponds to the latest state of facts or knowledge and/or state of scientific discussions of the field or subject dealt with;
- meeting all deadlines set. The deadlines set for each of the contributions will depend on the size of the manuscript and might span three to nine months;
- providing copies of texts and/or illustrations of third parties, which may be required for the completion and/or illustration of the contribution, provided that they do not have to be provided by the volume editors;
- providing clear and correct representations of formulae, reaction equations, and reaction schemes in electronic form. The publisher will advise the contributing author concerning the optimal form of presentation. The publisher is authorized to rework the artwork (graphics) in order to improve the presentation or to make it consistent with the overall style of the work;
- carrying out their duties in good cooperation with potential coauthors of the contribution and additional authors of *Stereoselective Synthesis* as well as in close contact with the volume editors and the publisher, and, at request, informing the volume editors and the publisher at any time about the status of the contribution;
- giving his/her Imprimatur for their contribution.

2.1.3 The Editorial Office

The tasks of the Editorial Office include:

- assisting the volume editors during the volume planning process;
- providing monthly status reports on the progress of the volumes to the volume editors;
- sending an author's agreement to the author at the volume editor's request;
- setting publication dates and targets;
- coordinating and monitoring deadlines;
- copyediting the revised draft manuscript according to *Stereoselective Synthesis* house style;
- sending copies of the page proofs to the volume editors and author;
- proofreading the page proofs and making any necessary corrections (including those indicated by the volume editors and author);
- preparing and checking the covers, title pages (indexes if necessary), and other aspects of the final published contribution and/or volume.

2.2 The Participants**2.2.1 The Volume Editors****Prof. Johannes G. de Vries**

Principal Scientist Homogeneous Catalysis
DSM Pharmaceutical Products

P.O. Box 18
6160 MD Geleen
The Netherlands

Phone: +31 (46) 476-1572

Fax: +31 (46) 476-7604

E-mail: Hans-JG.Vries-de@dsm.com

**Prof. P. Andrew Evans**

The University of Liverpool
Department of Chemistry, Room 134
Crown Street

Liverpool L69 72D

UK

Phone: +44 (151) 794-3525

Fax: +44 (151) 794-1377

E-mail: andrew.evans@liverpool.ac.uk

Prof. Gary A. Molander

Roy and Diana Vagelos Laboratories
Department of Chemistry, University of Pennsylvania

231 South 34th Street

Philadelphia, PA 19104-6323

USA

Phone: +1 (215) 573-8604

Fax: +1 (215) 573-7165

E-mail: gmolandr@sas.upenn.edu



**2.2.2 Thieme Chemistry: Editorial, Sales, Marketing,
and Software Development**

Georg Thieme Verlag KG
Rüdigerstraße 14
70469 Stuttgart
Germany
Fax: +49 (711) 8931-777
E-mail: science-of-synthesis@thieme.de
Web site: www.science-of-synthesis.com

Dr. M. Fiona Shortt de Hernandez
Managing Editor
Phone: +49 (711) 8931-783
E-mail: fiona.shortt@thieme.de

Dr. Karen M. Muirhead-Hofmann
Senior Scientific Editor
Phone: +49 (711) 8931-767
E-mail: karen.muirhead@thieme.de

Dr. Mark H. Smith
Senior Scientific Editor
Phone: +49 (711) 8931-787
E-mail: mark.smith@thieme.de

Dr. Toby B. Reeve
Scientific Editor
Phone: +49 (711) 8931-742
E-mail: toby.reeve@thieme.de

Dr. Alex G. Russell
Scientific Editor
Phone: +49 (711) 8931-788
E-mail: alex.russell@thieme.de

Dr. Matthew Weston
Scientific Editor
Phone: +49 (711) 8931-785
E-mail: matthew.weston@thieme.de

Dr. Marcus J. White
Scientific Editor
Phone: +49 (711) 8931-880
E-mail: marcus.white@thieme.de

Dr. Joe P. Richmond
Freelance Scientific Editor
Phone: +49 (711) 120-5605
Fax: +49 (711) 120-5604
E-mail: joe.richmond@t-online.de

Michaela Frey
Production Coordinator
Phone: +49 (711) 8931-789
E-mail: michaela.frey@thieme.de

Angela Gilden
Editorial Secretary
Phone: +49 (711) 8931-719
E-mail: angela.gilden@thieme.de

Bernd Hess
Director Institutional Sales
Phone: +49 (711) 8931-838
E-mail: bernd.hess@thieme.de

Dr. Thomas Krimmer
Director Institutional Marketing
Phone: +49 (711) 8931-780
E-mail: thomas.krimmer@thieme.de

Dr. Rolf Hoppe
Project Leader Software Development
Phone: +49 (711) 8931-780
E-mail: rolf.hoppe@thieme.de

3 Manuscript Preparation

The publication of *Stereoselective Synthesis* as an electronic version demands absolute consistency of structure and style for the manuscripts. Authors are therefore requested to carefully read and follow the instructions for authors. Furthermore, manuscripts of the appropriate length and style will help to reduce costs and time-consuming editing. Only manuscripts perfect in style will be suitable for the production of the electronic version of *Stereoselective Synthesis*.

3.1 General Criteria

Stereoselective Synthesis will critically evaluate the methods that are of most significance for modern stereoselective synthesis. Please see Section 1.3 for the *Stereoselective Synthesis* selection criteria.

Books, journals, and the patent literature must be considered equally. References to patents should be given whenever they contain relevant information.

3.2 Disposition of the Manuscript

For each volume the volume editors will specify a general outline which will serve as a guideline to all authors. Authors will be recruited by the volume editors. Authors will then submit for approval to the volume editors a table of contents according to the general outline. **The authors are requested not to exceed the given number of printed pages for each volume. The authors are asked to contact the volume editors and the Editorial Office if their manuscripts differ from the agreed length of the manuscript.** For estimating the final length of a contribution, the following general rules should be used (assuming that the author has used the document template):

- 1 typewritten page = 24 lines of 75 characters
- 3 typewritten pages (without schemes and tables) = 1 printed page
- 2 typewritten pages (with schemes and tables) = 1 printed page

3.3 Guidelines for Text

3.3.1 Format of Text

Authors must produce their text with word processors. The text should be typed with 1.5 times spacing (at least 5 mm between lines) in all parts of the manuscript (including references, notes, figure captions, and tables) and wide margins (ca. 2 cm at top, bottom, left- and right-hand side of each page). We recommend ca. 75 characters per line in a large proportional script (e.g., 12 point Times New Roman). Underlining, indentations, and block capitals should be avoided. Boldface and italic fonts should be used according to the instructions [e.g., amine **6**; *J. Org. Chem.*, (1973) **38**, 3438]. References, notes, schemes, and figures (in this order) should be included at the end of the manuscript. Tables should be included in the appropriate position in the body of the text. All pages including author's address, contents, text, references, notes, and tables must be numbered consecutively. Tables, schemes, formulas, and figures should be numbered with Arabic numbers, not Roman numerals.

3.3.2 Style of the Manuscripts

- Use American spelling according to Webster's Dictionary [Merriam-Webster: Springfield MA, (1990)].
- For style of the manuscripts the ACS Style Guide [The ACS Style Guide, 2nd ed.; Dodd, J. S., Ed.; American Chemical Society: Washington D. C., (1997)] should be consulted.
- Authors should indicate trademarks and registered trademarks by capitalization of the first letter.
- All parts of the manuscript should be written in the **present** or **relevant** tense, except for the **experimental procedures**, which should be written in the **past** tense.

3.3.3 Nomenclature

In *Stereoselective Synthesis*, systematic names will be given only to selected examples. "Correct" nomenclature should be used, **based on the rules of IUPAC** [see: A Guide to IUPAC Nomenclature of Organic Compounds: Recommendations 1993, Blackwell Scientific: Oxford, (1993)]. Whilst the IUPAC system is preferred whenever possible, names based on the systematic rules adopted by Chemical Abstracts (Appendix IV of the current Chemical Abstracts Index Guide) will be accepted if necessary. **Do not use a mixture of both systems**, either within the same name or anywhere within the manuscript. An exception is the naming of ring systems, whose names and numberings may be taken or derived from the Ring Systems Handbook [American Chemical Society: Columbus OH, (1988) and supplements]. For biochemical nomenclature see: Compendium of Biochemical and Related Documents, Portland Press: London, (1992). Nomenclature for inorganic compounds is provided by the corresponding IUPAC rules [Nomenclature of Inorganic Chemistry, 1970, Butterworths: London, (1971), and Recommendations, 1990, Blackwell Scientific: Oxford, (1990)]. Names of common reagents and solvents are to be retained, e.g. diethyl ether. Trivial names should be avoided unless they offer a distinct advantage over the corresponding systematic name. For classes of complex natural compounds, such as carbohydrates, peptides, or steroids, the most common name should be given. Compounds which are not named or have long names should be referred to unambiguously as "amine 2" or "thioester 14". In matters of style, i.e. which words or prefixes are hyphenated, italicized, capitalized, etc., consult the ACS Style Guide [The ACS Style Guide, 2nd ed.; Dodd, J. S., Ed.; American Chemical Society: Washington D. C., (1997)].

3.3.4 Units

- For pressure, Torr, atm, or Pa are to be used [note: 1013.25 mbar = 760 Torr = 101 325 Pa = 14.696 psi].
- For temperature, use °C. For very low temperatures, K is also acceptable.
- Metric units (SI) should be used in all other cases, although the unit kcal will also be accepted.

3.3.5 Abbreviations

- Abbreviations and simple chemical formulas (e.g., CH₂Cl₂) should be used in tables, schemes, and experimental procedures.
- Do **not** use abbreviations in titles or the discussion text.
- Common abbreviations used in *Stereoselective Synthesis* are given in tables to be found in the Appendix.

3.3.6 Experimental Procedures

- Experimental procedures should follow the style of the Thieme journal SYNTHESIS.
- The experimental procedure itself is entitled with the product, or general classification of the product name, followed by the compound number.
- All experimental procedures should be classified as one of the following:
 1. General Procedure: A generalized version of a widely applicable experimental procedure.
 2. Typical Procedure: A specific example of a widely applicable experimental procedure.
 3. Single Procedure: Single procedures are not to be labeled, but are defined as follows: A specific experimental procedure for a single compound which is not applicable to similar compounds or for which the scope has not been studied.

As the criteria used to assess experimental procedures include range of applicability, the majority of procedures will be Typical or General Procedures; nontypical procedures for individual examples are restricted to unique methods that are particularly useful for the synthesis of one synthetically important compound or intermediate.

- All titles of experimental procedures should have a reference citation.
- The author should indicate aspects of the procedure which are particularly critical to success, including any new observations on or adaptations of older literature methods.
- Available details of workup should be included.
- Authors are encouraged to specifically discuss if a described method has proven to be useful for solid-phase reactions.
- Physical or spectroscopic data should be given only to a very limited extent. Authors should choose **significant** spectroscopic data (e.g., shifts of important NMR signals) of the products. These data should help chemists to repeat the procedures and identify the products.
- The slash symbol is to be used for: (1) surfaces, e.g. Pd/C; (2) alloys and amalgams, e.g. 5% Na/Hg, Na/K (1:1); (3) solvent mixtures, e.g. EtOH/MeOH (95:5); (4) reagent concentrations, e.g. 2% HCl/H₂O; (5) single reagents, e.g. Li/NH₃.
- Write procedures in the **past** tense and include the weight, number of moles, volume, etc., in brackets **after** the name of the substances or solvents.
- Avoid starting sentences with numbers, wherever possible.
- Procedures from preparative book series, such as Organic Syntheses are **not allowed** for reproduction. If necessary, a short comment on relevant procedures of the same type should be made.

3.3.6.1 Example Experimental Procedure

CAUTION: *Technical grade chloromethyl methyl ether is classified as a human carcinogen, and is an eye and respiratory tract irritant.*

Tributyl[(2R)-3-(methoxymethoxy)-2-methylpropyl]stannane (4B):^[25]

A soln of crude 3B (7.3 g, from 15 mmol of 2B) in THF (40 mL) was cooled in an ice bath and NaOH (1.5 g, 37 mmol) in H₂O (8 mL) was added, followed by dropwise addition of 30% H₂O₂ (5 mL, 50 mmol). The mixture was kept at 0 °C for 1 h, and then at 25 °C for 6 h, during which time a pasty, colorless precipitate formed. The mixture was treated with Et₂O (50 mL) and filtered. The aqueous phase was separated and extracted with Et₂O (3 × 30 mL) and the combined organic phase was dried (MgSO₄) and concentrated. The gel-like residue was flash chromatographed [silica gel, petroleum ether (bp 30–40 °C)/Et₂O 9:1] to give the labile intermediate; yield: 3.98 g (76%); this was reacted further without characterization. To a soln of the intermediate (3.6 g, 10 mmol) in CH₂Cl₂ (10 mL) was added iPr₂NEt (1.2 g, 10 mmol), followed by MOMCl (0.89 g, 11 mmol). The mixture was stirred for 1 h at 0 °C and 15 h at 25 °C,

and then concentrated. The resultant residue was treated with ice-cold 2 M HCl (10 mL) and extracted with petroleum ether (bp 30–40 °C; 2 × 20 mL). Concentration of the organic phase (10 Pa) gave the product as a colorless solid; yield: 3.7 g (92%); mp 130 °C.

3.3.7 Safety

Chemicals are associated with two types of hazard: hazards that are a direct result of the physical or reactive properties of a chemical; and hazards posed by the effect of a chemical on biological systems. Flammability and the stability of a chemical in air or toward water may be included in the first group, while the carcinogenic potential of a chemical or its effect on the reproductive system are health hazards due to the biological properties of a chemical. The different hazardous properties that authors should take into consideration when evaluating experimental procedures are as follows:

Physical and reactive chemical hazards:

- Flammability
- Explosive properties
- Stability in air or in contact with water (pyrophoric and water-reactive compounds)
- Incompatibility with commonly-available chemicals and reagents
- Potential for peroxidation
- Oxidizing or reducing properties
- Storage properties

Health effects of chemicals:

- Known human carcinogens and probable human carcinogens according to the International Agency for Research on Cancer (IARC) classifications
- Known human teratogens
- Chemicals known to have an effect on human reproduction
- Chemicals that are irritants to the skin, eyes, and respiratory system (data from human exposure or animal tests)
- Chemicals that are corrosive to the skin, eyes, and respiratory system (data from human exposure or animal tests)
- Skin sensitizers
- Chemicals that are highly toxic as a result of some specific pharmacological mechanism (e.g., the potent neurotoxin tetrodotoxin)

Hazard information may be found in:

Rhodes, P. H., *The Organic Chemist's Desk Reference*, Chapman & Hall: London, (1995); pp 112–126.

Urban, P. G., Ed., *Bretherick's Handbook of Reactive Chemical Hazards*, 6th Edition, Butterworth-Heinemann: Oxford, (1999).

Luxon, S. G., Ed., *Hazards in the Chemical Laboratory*, 5th Edition, Royal Society of Chemistry: Cambridge, (1992).

It is important that authors discuss potential hazards of the described compounds. Furthermore, the methods described in *Stereoselective Synthesis* should be discussed in terms of atom economy, as well as their possible impact on the environment. If toxic solvents (e.g., chloroform), toxic catalysts [e.g., mercury(II) chloride], toxic reagents (e.g., phosphene), or any other hazardous compounds are used or recommended in certain experimental procedures, alternatives should be discussed. Safety guidelines should be given for dangerous compounds or procedures. Warnings should be given using the following format:

CAUTION: Hexamethyltungsten(VI) is known to decompose explosively. Proper safety precautions should be taken during its synthesis, storage, and handling.

3.3.8 Copyright

It is the responsibility of the author to obtain, where necessary, copyright permission for figures (see Section 3.7), tables, schemes, or textual information from another source that is to be reproduced in a *Stereoselective Synthesis* contribution. The Editorial Office can always be contacted for advice on such matters, and will help authors to direct applications to the appropriate departments. In the case of reproduction of experimental procedures and schemes from journal publications, a full citation in the references section is sufficient acknowledgement of copyright ownership. Problems concerning copyright infringement usually arise when text or figures are taken from books [e.g., Brandsma, L.; Verkrujssse, H. D., *Synthesis of Allenes and Cumulenes*, Elsevier: Amsterdam, (1981)] or serial publications [e.g., *Organic Syntheses, Coll. Vol. VI*, Noland, W. E., Ed; Wiley: New York, (1988)] without significant adaptation of the original version. The copy editor assigned to each manuscript will advise the author of the need to obtain copyright, if they have not already done so, and will add the appropriate credit line. If there is an appropriate and adequate alternative to a reference requiring copyright then this reference should be substituted, or if a similar procedure is available then this procedure should be used instead of that under copyright. Permission request forms are in the author's information package or can be obtained from the Editorial Office.

3.4 Guidelines for References and Cross-References

- References should be placed collectively at the end of the text (in Part 4 of your manuscript, entitled “References”).
- References should be numbered consecutively within chapters, with no subdivisions such as ^[3a], ^[3b], ^[3c], etc.
- Each reference number should contain only one citation.
- Use one reference number for each reference only; do not repeat a reference citation with a new number every time it appears.
- References to literature appear in the text, tables, and scheme headings as superscript 10 pt Arabic numerals in square brackets following the punctuation, e.g. This is a sample sentence.^[1]
- Authors should include reference numbers for schemes and figures in the scheme/figure caption.
- Reference numbers for tables should be included in the tables as the final column, with the heading Ref.
- *Journals*: provide the names of all authors. Do not use “et al.”. A comma should be used to separate the name of the last author and the title of the journal.
- Use the journal abbreviation in accordance with the approved list given in Section 4.2. This is based on that of *Chemical Abstracts* [*Chemical Abstracts Service Source Index (CASSI) 1907–1994 Cumulative* and its supplements].
- *Books*: see sample references for books with and without editors.
- *Patents*: see sample reference. Important patents should be read in the original versions as *Chemical Abstracts* reports often do not contain all important details.
- *Databases*: reference can also be given to records in databases (e.g., spectra from databases such as Specinfo).
- If reference is made to a patent or less readily available journal, the *Chemical Abstracts* reference or the English translation [e.g., *J. Gen. Chem. USSR (Engl. Transl.)*] should also be cited.
- *Science of Synthesis* will support the citation of electronic journals. As soon as general document identifiers for journal articles are available, the editorial office will include them to allow users direct access to these references.
- The use of a reference-managing program (e.g., EndNote) is strongly recommended.

- References to *Houben–Weyl* should only be given if it is not possible to substitute these with a cross-reference in the running text. References to *Science of Synthesis* should be avoided: always give a cross-reference in these cases.
- Cross-references to *Houben–Weyl* include volume and page number, whereas those to *Science of Synthesis* include the volume and section number, e.g. *Houben–Weyl*, Vol. 13/9b, pp 632–700 or *Science of Synthesis*, Vol. 10, Section 10.1.1.3.1.4.

3.4.1 Sample References

- [1] Trost, B. M.; Biddlecom, W. G., *J. Org. Chem.*, (1973) **38**, 3438.
- [2] Hoppe, D.; Gonschorrek, C.; Egert, E.; Schmidt, D., *Angew. Chem.*, (1985) **97**, 706; *Angew. Chem. Int. Ed. Engl.*, (1985) **24**, 700; footnote 12.
- [3] Pratt, A. J.; Thomas, E. J., *J. Chem. Soc., Perkin Trans. 1*, (1989), 1521.
- [4] Abdrakhmanov, I. B.; Mustafin, A. G.; Tolstikov, G. A., *Izv. Akad. Nauk SSSR, Ser. Khim.*, (1988) **8**, 1852; *Chem. Abstr.*, (1989) **110**, 192619.
- [5] Ingold, C. K., *Structure and Mechanism in Organic Chemistry*, Cornell University: New York, (1953); pp 598, 619.
- [6] Ziegler, F. E., In *Comprehensive Organic Synthesis*, Trost, B. M.; Fleming, I.; Paquette, L. A., Eds.; Pergamon: New York, (1993); Vol. 5, p 875.
- [7] Iseki, K.; Kobayashi, Y., In *Biomedical Frontiers of Fluorine Chemistry*, Ojima, I.; McCarthy, J. R.; Welch, J. T., Eds.; ACS Symposium Series 639; American Chemical Society: Washington, DC, (1996); p 214.
- [8] Simchen, G., In *Houben–Weyl*, (1986); Vol. E 5, p 3.
- [9] Bellus, D.; Sauter, H.; Weis, C. D., *Org. Synth., Coll. Vol. VI*, (1988), 427.
- [10] Alper, H., EP 305 089, (1989); *Chem. Abstr.*, (1989) **112**, 76610.
- [11] Studer, A., Ph.D. Dissertation ETH Zürich, (1995), pp 3, 116; cf. ref 14.
- [12] Kajimoto, T.; Liu, K. K.-C.; Pederson, R. L.; Zhong, Z.; Ichikawa, Y.; Porco, J. A., Jr.; Wong, C.-H., *J. Am. Chem. Soc.*, (1991) **113**, 6187.
- [13] Smith, A. B., III; Fukui, M.; Vaccaro, H. A.; Empfield, J. R., *J. Am. Chem. Soc.*, (1991) **113**, 2071.

3.5 Guidelines for Tables and Scheme Tables

Tables

Tables should be used to display examples of similar products prepared by a given method or variation in order that they may be critically discussed in the text.

Do not list every example known; only selected examples should be given.

Tables should contain 5 to 10 examples and should be placed in the appropriate position in the body of the text. Tables should be numbered with Arabic numerals and have captions with initial letters of major words capitalized. When referring for the first time to information given in a table, please quote the table number in brackets. The position of a table should be indicated in the text in the following way:

<Table 1> This is a Sample Caption^[33]

In tables, collect comparable examples and quote, in the following order:

1. The starting material represented pictorially, e.g. either present a generalized equation above and then give only substituents R¹, R², X, etc. (*vide infra*) or, in the case of structurally diverse substrates, give the entire formula. An entry number is also acceptable for identifying the starting material. In all cases, arrange the examples in a manner which best illustrates the scope and limitations of the method (e.g., they may be listed in increasing order of substituent/reagent complexity, or in increasing order of chemical or optical yield, etc.).

2. Reagents, solvents, temperature, times, as applicable.
3. Product (formula or entry number).
4. ee, er (preferred), dr when applicable.
5. Yield data.
6. Physical data, if relevant (e.g., mp).
7. Citation of the relevant literature.

<Table 1> Caption^[ref nos]

Starting Material or Entry	Reaction Conditions I	Reaction Conditions II	Product	er or dr	Yield (%)	Ref
(formula or entry number)	(reagents, catalysts, solvents)	[Temp (°C), pressure (Torr)]	(formula or R groups)			

Scheme Tables

Scheme tables should be employed in conjunction with schemes if the latter are likely to become overcluttered with textual notes. Scheme tables should not contain entry numbers. They should be used to illustrate methods (or variations) when: (1) there are 6 or more examples for the method but they are not actively and individually discussed in the main text, and thus presented in a normal table (*vide supra*); (2) there are fewer examples but they contain several varying R substituents on the reagent(s) in the scheme; (3) there are different conditions (e.g., solvent, temperature, ratio of reactants) employed for the same reaction which have a significant influence on the yield, purity, or optical purity, etc. of the product. All other cases should simply include the examples within the scheme itself (*vide infra*).

The content and layout of a scheme table should be similar to that employed for a table, and in all cases kept as simple as possible. An example of a scheme table is given below:

Scheme 12 Oxidation of Aryl Sulfides with Hydrogen Peroxide in the Presence of Various Catalysts^[54–58]

Ar ¹	R ¹	Conditions/Catalyst	Yield (%)	Ref
4-ClC ₆ H ₄	Me	H ₂ O ₂ , VO(acac) ₂ , EtOH, rt	90	[54,55]
Ph	Ph	UHP ^a , Re(PPh ₃) ₂ OCl ₃ , MeCN	92	[56]
Ph	Ph	H ₂ O ₂ , TiCl ₃ , EtOH, rt	100	[57]
Ph	Et	H ₂ O ₂ , TeO ₂ , HCl, MeOH	92	[58]

^a UHP = urea–hydrogen peroxide adduct.

Scheme tables should be placed below the relevant scheme heading **in the body of the text**, i.e. they should be included as part of the word processor document. Scheme tables will not have a caption but should be headed <Schemetable n> where n is the same number as the corresponding scheme.

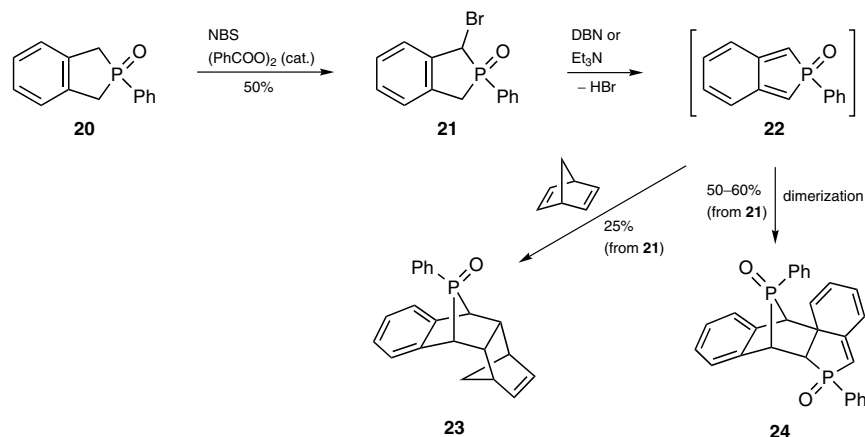
3.6 Guidelines for Schemes

- The schemes should be visual abstracts of the reactions performed, hence flow diagrams are preferred to individual structures.
- Schemes should be numbered with Arabic numerals and have captions with initial letters of major words capitalized.
- When referring for the first time to information given in a scheme, please quote the scheme number in brackets.
- A scheme should be indicated in the text in the following way:
<Scheme 1> This is a Sample Scheme^[10]
- Schemes should be placed separately at the end of your manuscript. Schemes and figures must be submitted on a separate sheet. They should **not** be electronically embedded in the text.
- Schemes should not exceed a width of 16 cm; schemes wider than this will not be accepted.
- Reaction arrows normally should be oriented horizontally, using more than one "line" if necessary. If there are still space constrictions arrows oriented vertically or at 45° angles may be permitted. Authors should try to make economic use of the space.
- Products of experimental procedures (and substrates and intermediates that are referred to in the text) should be numbered with bold, Arabic numbers from left to right in sequence as they appear in the schemes. Begin from **1** at the start of each manuscript.
- Not every compound in a scheme needs to have a number. However, the title compound in an experimental procedure should have a number.
- For compounds with different substituents, the labels R¹, R², X, etc. must be used and explained below the reaction scheme or in a table. Do not use R without a superscript.
- Use ⁺ and ⁻ (i.e., plus and minus symbols as superscripts) for electric charges (do not circle them).
- Two dots should be used to indicate a lone pair.
- Reagents, conditions, etc., should appear above the arrow, only.
- Unstable intermediates should be drawn in square brackets (see below).
- Each individual reagent, condition, etc., should be separated from the next by a comma and one character space, not a semicolon or solidus (forward slash); no comma should appear at the end of a line.
- Reagents, conditions, etc., appear in the following order:
 - (1) Reagents, including catalysts, e.g. H₂(g), Pd/C, Pd(PPh₃)₄.
 - (2) No. of equivalents.
 - (3) Solvents.
 - (4) Special apparatus, e.g. sealed tube, autoclave.
 - (5) Temperature, e.g. rt, 50 °C, reflux.
 - (6) Pressure, e.g. 5 atm, 100 Pa.
 - (7) Time, e.g. 5 min, 6 h, 12 d.
- Eliminated products (preceded by a minus sign) and the reaction yield appear below the arrow.
- Please do not use wedged bonds (bold or hashed) to represent chiral centers; use normal bold or hashed bonds instead.
- References will not appear in schemes but in the scheme headings.
- For intermediates in schemes the following rules apply:
 1. Isolable intermediates are to be included in schemes and will get put into a separate reaction database for reaction searching.

2. Elusive intermediates and transition states can also be put into schemes but they will not be included in the reaction database. They should be placed within square brackets.

Scheme 1 shows an illustrative example of a reaction scheme.

Scheme 1 Generation and Diels–Alder Reaction of Benzophospholes^[8,9]



For drawings prepared by CSC ChemDraw, use the following settings, printed at 100% (page setup = 100%).

Choose settings type:	Science of Synthesis, except for the margin width	
Font for atoms labels:	10 point Arial	
Font for reaction conditions, yields, etc.:	8 point Arial	
Font for compound numbers:	10 point Arial bold	
Chain angle:	120 degrees	
Bond spacing:	18 % of length	
Fixed length:	17 point	(0.600 cm, 0.236")
Bond width:	2.0 point	(0.071 cm, 0.027")
Line width:	0.8 point	(0.028 cm, 0.011")
Margin width:	2.2 point	(0.079 cm, 0.031")
Hash spacing:	2.5 point	(0.088 cm, 0.035")

Science of Synthesis document settings can be selected automatically in recent versions of ChemDraw.

3.7 Guidelines for Figures

Figures should be numbered with Arabic numerals. When referring for the first time to information given in a figure, please quote the figure number in brackets. Figure captions will not be listed at the end of the manuscript and will instead stay in the manuscript. A figure should be indicated in the text in the following way:

<Figure 1> This is a Sample Figure^[23]

Figures should be placed separately in Part 5 of your manuscript. They must **not** be electronically embedded in the text.

If necessary, figures will be redrawn by the publishers. For checking and correction, the redrawn figures will be sent back to the author. In the case of figures taken from existing publications, **it is the legal responsibility of the author to obtain permission for reproduction from the copyright holder**, although the Editorial Office can offer assistance with such matters; this should be done at a very early stage of the book production. For figures of apparatus, please directly contact the apparatus producer company. If figures are not produced by the author, the copyright of the figure must be included in the caption. Submit only original figures or high-quality photographic prints of originals. For the preparation of graphs, authors are requested to follow the suggestions of H. G. Hers [*Nature*, (1984) 307, 205].

3.8 Delivery of the Manuscripts

3.8.1 Table of Contents

Authors are requested to send a copy of their table of contents to the Editorial Office and to the appropriate volume editor by e-mail (science-of-synthesis@thieme.de). Authors will then receive a revised table of contents with comments and suggestions from the volume editor and/or the Editorial Office.

3.8.2 Submission of Final Manuscript

Please send a copy of your completed manuscript to the volume editor, who will advise on revision if necessary. The **final** version of the revised manuscript has to be sent to the Editorial Office by e-mail (science-of-synthesis@thieme.de) by the agreed deadline.

3.8.3 Copyediting Process

The manuscript submitted to the Editorial Office will then be assigned to a copy editor who will copyedit the manuscript and apply the necessary styles for *Science of Synthesis*, e.g. check nomenclature, grammar, syntax, punctuation, phrasing, redundancy of text, and the like. Copy editors will correspond directly with authors regarding any queries and try to resolve them before proceeding to the page proof stage. It is inevitable that corrections will still need to be made to the page proofs, but each copy editor will aim to eliminate as many errors as possible prior to this stage by editing the manuscript thoroughly. The Editorial Office will then use the manuscripts for the production of the electronic version and prepare them for typesetting.

3.8.4 Page Proofs

At this stage page proofs will be sent to the author and volume editor for correction. The correction of page proofs should be limited to the correction of printing errors or other mistakes and should not involve major changes to the text. If more extensive corrections are necessary as a result of significant new developments, the volume editor should be consulted. Please note that the symbols ■■■ indicate that something was missing or unclear in the manuscript and the pertinent information should be added during correction. The page proofs should be returned to the Editorial Office by the deadline given. The author's and volume editor's responsibilities end with the correction of the page proofs. The author and volume editor then sign the page proofs as a permission to publish the manuscript (*Imprimatur*). By accepting a manuscript the publisher acquires all rights, in particular copyright and the right of translation. The proof sheets are not indicative of the quality of the final print.

The page layout of the contribution follows the proof correction, i.e. the text is laid out to the exact page length, the pages are numbered, and tables, schemes, and figures are placed as near as possible to the positions indicated by the author and volume editor in the page proofs.

3.9 Use of the Document Template

Authors will be able to download style templates for their word-processing programs from the *Science of Synthesis* Web site (www.science-of-synthesis.com).

The *Science of Synthesis* document template contains a list of formatting styles that have to be applied to the chapter captions of your manuscript. The file is called **scisynth.dot**. However, the manuscript will not have the same print format as shown in the sample chapter. The sample chapter as it appears by using the template can also be found online: **elecsamp.doc**. This file is intended to illustrate how the template should be used. It also shows that at this stage manuscripts do **not** have the same format as in print.

3.10 Frequently Asked Questions

Q: Does the document template have to be used?

A: It is important for the development of the electronic version that the appropriate style name (e.g., H_Method) is attached to the heading paragraphs for each section. It is not important that formatting properties such as font size, line spacing, or the number of lines per page match the document template. Please feel free to change these properties as long as the style naming is not reflected. Apart from style names all formatting options will be deleted by the document processing program. The document template is designed to make formatting the manuscript easier for the user in that the appropriate style can be chosen quickly from the menu.

Q: I have never used a template before and am not sure where to start.

A: There is a Readme file provided with the document template. It is advisable that you print this out and read it first.

Q: I don't know where to save the template file (scisynth.dot).

A: It is difficult to state categorically where individual users save their template files. On a PC, on which the whole Microsoft Office software package is installed, it is normally in the directory C:\MSOffice\Template. With only the Microsoft Word processor installed you will find the directory under C:\MSWord\Template. For the MAC it strongly depends on the version of Word used. Newer MAC Word versions have the same menu items as the Windows Word versions. The folder where the document templates are stored can be detected in Word in "Tools|Templates and Add-Ins". If in doubt, please refer to the in-house computer specialist for advice.

Q: Is it acceptable to adjust the font size and spacing?

A: The font type and style of the text is important for its identification. Font size and spacing is not important.

Q: How should I handle tables?

A: Tables should be composed using the table set-up tools of the word processing program. Tables should be placed in the appropriate position in the body of the text. The tables in the text should be labeled clearly with the caption e.g. <Table 1> (Times).

Q: How should I handle drawings in tables?

A: State the file name of the drawing (handwritten) in the required position in the table on the hardcopy of the manuscript. Store the drawing as a separate file using the formula name as the file name.

Q: Is it possible to handle several schemes in one file?

A: No. Each scheme should be saved in a separate file as should any figures using the scheme or figure number as the file name e.g. scheme1.cdx.

Q: What word processing program should I be using?

A: The following word processing programs are preferred:

- Microsoft Word 2000
- Microsoft Word 2002
- Microsoft Word 2003
- Microsoft Word for Macintosh 6.0 or higher

The document template is currently available for all of these packages. For other word processors please contact the Editorial Office and discuss your requirements. However the use of LATEX should be avoided.

Q: What structure drawing program should I be using?

A: Please generate your schemes using ChemDraw (preferably the latest version both for Microsoft Windows or for Macintosh) or by using ISIS/Draw.

Q: What are the page extent rules for manuscript submission?

A: The volume editors and authors are requested to be aware of the contracted page extent as outlined in the Contributing Author's Agreement, and to not exceed the given number of printed pages for each volume. For estimating the final length of a contribution, the following general rules should be used:

- 1 typewritten page = 24 lines of characters
- 2 typewritten pages (with tables/schemes) = 1 printed page
- 3 typewritten pages (no tables/schemes) = 1 printed page

Q: Do I need to use any particular units or abbreviations?

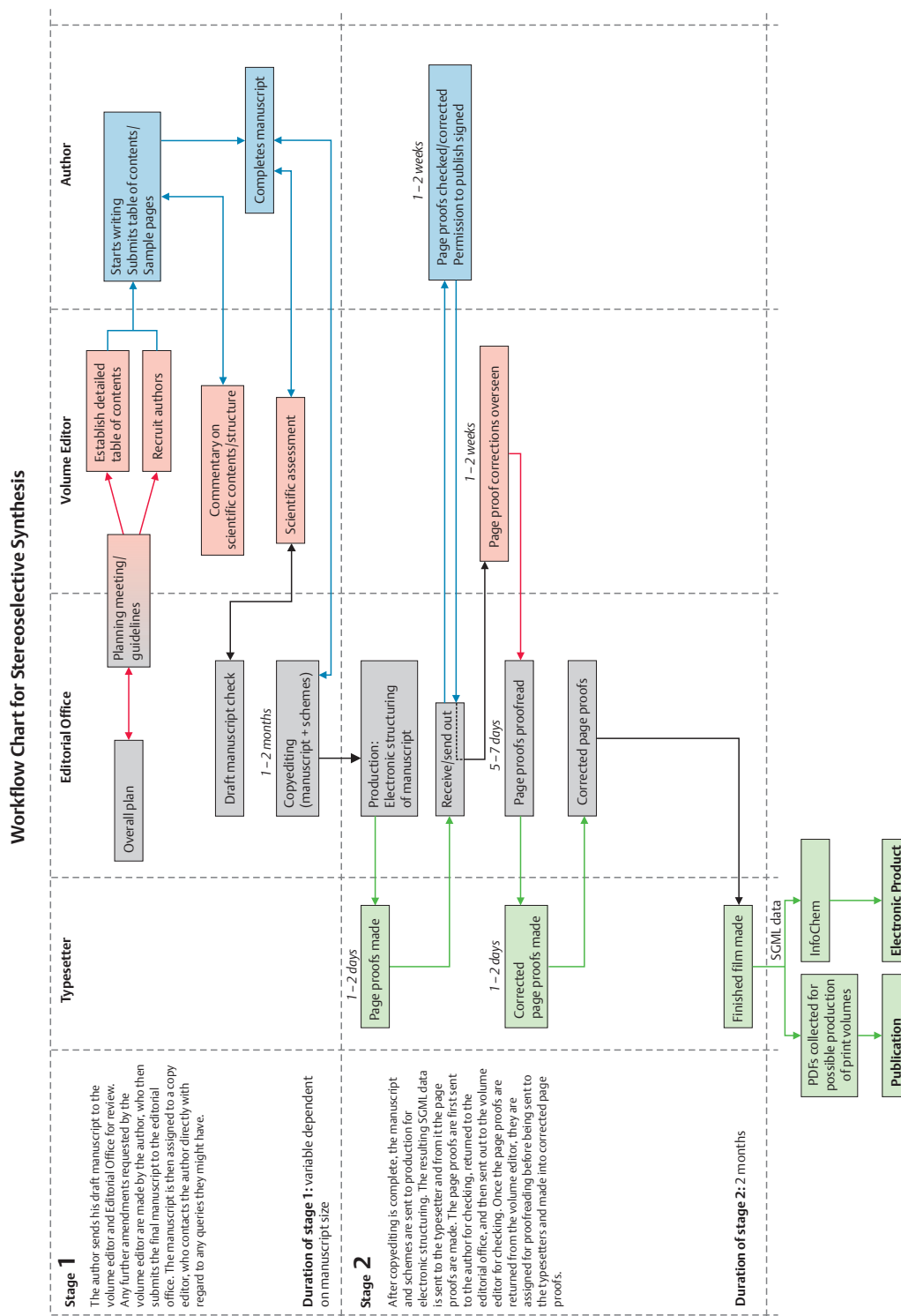
A: Metric units should be used throughout the text. However, for pressure and temperature, Torr/atm/Pa and °C can be used, respectively. The unit kcal is also accepted. The use of abbreviations is recommended in schemes, tables, and experimental procedures, but not in titles or text. Please see the Appendix for a full list of abbreviations.

Q: What do the symbols ■■■ in the page proofs mean?

A: The symbols indicate that something is missing or unclear in the manuscript and the author should add the missing information during correction.

Q: What is the difference between a General Procedure and a Typical Procedure?

A: A General Procedure is a generalized version of a widely applicable experimental procedure. A Typical Procedure is a specific example of a widely applicable experimental procedure.



4 **Appendix**4.1 **Chemical and General Abbreviations used in *Stereoselective Synthesis*****Chemical**

Name Used in Text	Abbreviation Used in Tables and on Arrow in Schemes	Abbreviation Used in Experimental Procedures
(<i>R</i>)-1-amino-2-(methoxymethyl)pyrrolidine	RAMP	RAMP
(<i>S</i>)-1-amino-2-(methoxymethyl)pyrrolidine	SAMP	SAMP
ammonium cerium(IV) nitrate	CAN	CAN
2,2'-azobisisobutyronitrile	AIBN	AIBN
barbituric acid	BBA	BBA
benzyltriethylammonium bromide	TEBAB	TEBAB
benzyltriethylammonium chloride	TEBAC	TEBAC
<i>N,O</i> -bis(trimethylsilyl)acetamide	BSA	BSA
9-borabicyclo[3.3.1]nonane	9-BBNH	9-BBNH
borane–dimethyl sulfide complex	BMS	BMS
<i>N</i> -bromosuccinimide	NBS	NBS
<i>tert</i> -butyldimethylsilyl chloride	TBDMSCI	TBDMSCI
<i>tert</i> -butyl peroxybenzoate	TBPB	<i>tert</i> -butyl peroxybenzoate
10-camphorsulfonic acid	CSA	CSA
chlorosulfonyl isocyanate	CSI	chlorosulfonyl isocyanate
3-chloroperoxybenzoic acid	MCPBA	MCPBA
<i>N</i> -chlorosuccinimide	NCS	NCS
chlorotrimethylsilane	TMSCI	TMSCI
1,4-diazabicyclo[2.2.2]octane	DABCO	DABCO
1,5-diazabicyclo[4.3.0]non-5-ene	DBN	DBN
1,8-diazabicyclo[5.4.0]undec-7-ene	DBU	DBU
dibenzoyl peroxide	DBPO	dibenzoyl peroxide
dibenzylideneacetone	dba	dba
di- <i>tert</i> -butyl azodicarboxylate	DBAD	di- <i>tert</i> -butyl azo-dicarboxylate
2,3-dichloro-5,6-dicyanobenzo-1,4-quinone	DDQ	DDQ
dichloromethyl methyl ether	DCME	DCME
dicyclohexylcarbodiimide	DCC	DCC
<i>N,N</i> -diethylaminosulfur trifluoride	DAST	DAST
diethyl azodicarboxylate	DEAD	DEAD
diethyl tartrate	DET	DET
2,2'-dihydroxy-1,1'-binaphthyllithium aluminum hydride	BINAL-H	BINAL-H
diisobutylaluminum hydride	DIBAL-H	DIBAL-H
diisopropyl tartrate	DIPT	DIPT
1,2-dimethoxyethane	DME	DME

Chemical (cont.)

Name Used in Text	Abbreviation Used in Tables and on Arrow in Schemes	Abbreviation Used in Experimental Procedures
dimethylacetamide	DMA	DMA
dimethyl acetylenedicarboxylate	DMAD	DMAD
2-(dimethylamino)ethanol	Me ₂ N(CH ₂) ₂ OH	2-(dimethylamino)ethanol
4-(dimethylamino)pyridine	DMAP	DMAP
dimethylformamide	DMF	DMF
dimethyl sulfide	DMS	DMS
dimethyl sulfoxide	DMSO	DMSO
di- <i>tert</i> -butyl peroxide	DTBP	DTBP
1,3-dimethyl-3,4,5,6-tetrahydro-pyrimidin-2(1 <i>H</i>)-one	DMPU	DMPU
ethyl diazoacetate	EDA	EDA
ethylenediaminetetraacetic acid	edta	edta
hexamethylphosphoric triamide	HMPA	HMPA
hexamethylphosphorous triamide	HMPT	HMPT
iodomethane	Mel	Mel
<i>N</i> -iodosuccinimide	NIS	NIS
lithium diisopropylamide	LDA	LDA
lithium hexamethyldisilazane	LiHMDS	LiHMDS
lithium isopropylcyclohexylamide	LICA	LICA
lithium 2,2,6,6-tetramethylpiperidide	LTMP	LTMP
lutidine	lut	lut
methylaluminum bis(2,6-di- <i>tert</i> -butyl-4-methylphenoxide)	MAD	MAD
methyl ethyl ketone	MEK	methyl ethyl ketone
<i>N</i> -methylmaleimide	NMM	NMM
4-methylmorpholine <i>N</i> -oxide	NMO	NMO
1-methylpyrrolidin-2-one	NMP	NMP
methyl vinyl ketone	MVK	methyl vinyl ketone
petroleum ether	PE ^a	petroleum ether
<i>N</i> -phenylmaleimide	NPM	NPM
polyphosphoric acid	PPA	PPA
polyphosphate ester	PPE	polyphosphate ester
potassium hexamethyldisilazane	KHMDS	KHMDS
pyridine	pyridine ^b	pyridine
pyridinium chlorochromate	PCC	PCC
pyridinium dichromate	PDC	PDC
pyridinium 4-toluenesulfonate	PPTS	PPTS
sodium bis(2-methoxyethoxy)aluminum hydride	Red-Al	Red-Al
tetrabutylammonium bromide	TBAB	TBAB

^a Used to save space; abbreviation must be defined in a footnote.^b py used on arrow in schemes.

Chemical (cont.)

Name Used in Text	Abbreviation Used in Tables and on Arrow in Schemes	Abbreviation Used in Experimental Procedures
tetrabutylammonium chloride	TBACl	TBACl
tetrabutylammonium fluoride	TBAF	TBAF
tetrabutylammonium iodide	TBAI	TBAI
tetracyanoethene	TCNE	tetracyanoethene
tetrahydrofuran	THF	THF
tetrahydropyran	THP	THP
2,2,6,6-tetramethylpiperidine	TMP	TMP
trimethylamine <i>N</i> -oxide	TMANO	trimethylamine <i>N</i> -oxide
<i>N,N,N',N'</i> -tetramethylethylenediamine	TMEDA	TMEDA
tosylmethyl isocyanide	TosMIC	TosMIC
trifluoroacetic acid	TFA	TFA
trifluoroacetic anhydride	TFAA	TFAA
trimethylsilyl cyanide	TMSCN	TMSCN

Ligands

acetylacetonato	acac
2,2'-bipyridyl	bipy
1,2-bis(dimethylphosphino)ethane	DMPE
2,3-bis(diphenylphosphino)bicyclo[2.2.1]hept-5-ene	NORPHOS
2,2'-bis(diphenylphosphino)-1,1'-binaphthyl	BINAP
1,2-bis(diphenylphosphino)ethane	dppe (not diphos)
1,1'-bis(diphenylphosphino)ferrocene	dppf
bis(diphenylphosphino)methane	dppm
1,3-bis(diphenylphosphino)propane	dppp
1,4-bis(diphenylphosphino)butane	dppb
2,3-bis(diphenylphosphino)butane	Chiraphos
bis(salicylidene)ethylenediamine	salen
cyclooctadiene	cod
cyclooctatetraene	cot
cyclooctatriene	cte
η^5 -cyclopentadienyl	Cp
dibenzylideneacetone	dba
6,6-dimethylcyclohexadienyl	dmch
2,4-dimethylpentadienyl	dmpd
ethylenediaminetetraacetic acid	edta
isopinocampheyl	lpc
2,3- <i>O</i> -isopropylidene-2,3-dihydroxy-1,4-bis(diphenylphosphino)butane	Diop
norbornadiene (bicyclo[2.2.1]hepta-2,5-diene)	nbd
η^5 -pentamethylcyclopentadienyl	Cp*

Radicals

acetyl	Ac
aryl	Ar
benzotriazol-1-yl	Bt
benzoyl	Bz
benzyl	Bn
benzyloxycarbonyl	Cbz
benzyloxymethyl	BOM
9-borabicyclo[3.3.1]nonyl	9-BBN
<i>tert</i> -butoxycarbonyl	Boc
butyl	Bu
<i>sec</i> -butyl	<i>s</i> -Bu
<i>tert</i> -butyl	<i>t</i> -Bu
<i>tert</i> -butyldimethylsilyl	TBDMS
<i>tert</i> -butyldiphenylsilyl	TBDPS
cyclohexyl	Cy
3,4-dimethoxybenzyl	DMB
ethyl	Et
ferrocenyl	Fc
9-fluorenylmethoxycarbonyl	Fmoc
isobutyl	<i>i</i> Bu
mesityl	Mes
mesyl	Ms
4-methoxybenzyl	PMB
(2-methoxyethoxy)methyl	MEM
methoxymethyl	MOM
methyl	Me
4-nitrobenzyl	PNB
phenyl	Ph
phthaloyl	Phth
phthalimido	NPhth
propyl	Pr
isopropyl	<i>i</i> Pr
tetrahydropyranyl	THP
tolyl	Tol
tosyl	Ts
triethylsilyl	TES
triflyl, trifluoromethanesulfonyl	Tf
triisopropylsilyl	TIPS
trimethylsilyl	TMS
2-(trimethylsilyl)ethoxymethyl	SEM
trityl [triphenylmethyl]	Tr

General

absolute	abs
anhydrous	anhyd
aqueous	aq
boiling point	bp
catalyst	no abbreviation
catalytic	cat.
chemical shift	δ
circular dichroism	CD
column chromatography	no abbreviation
concentrated	concd
configuration (in tables)	Config
coupling constant	J
day	d
density	d
decomposed	dec
degrees Celsius	$^{\circ}\text{C}$
diastereomeric ratio	dr
dilute	dil
electron-donating group	EDG
electron-withdrawing group	EWG
electrophile	E^+
enantiomeric excess	ee
enantiomeric ratio	er
equation	eq
equivalent(s)	equiv
flash-vacuum pyrolysis	FVP
gas chromatography	GC
gas chromatography–mass spectrometry	GC/MS
gas–liquid chromatography	GLC
gram	g
highest occupied molecular orbital	HOMO
high-performance liquid chromatography	HPLC
hour(s)	h
infrared	IR
in situ	in situ
in vacuo	in vacuo
lethal dosage, e.g. to 50% of animals tested	LD_{50}
liquid	liq
liter	L
lowest unoccupied molecular orbital	LUMO
mass spectrometry	MS
medium-pressure liquid chromatography	MPLC
melting point	mp
milliliter	mL
millimole(s)	mmol
millimoles per liter	mM
minute(s)	min
mole(s)	mol
nuclear magnetic resonance	NMR
nucleophile	Nu^-
optical purity	op
phase-transfer catalysis	PTC
proton NMR	$^1\text{H NMR}$

General (cont.)

quantitative	quant
reference (in tables)	Ref
retention factor (for TLC)	R_f
retention time (chromatography)	t_R
room temperature	rt
saturated	sat.
solution	soln
temperature (in tables)	Temp (°C)
thin layer chromatography	TLC
ultraviolet	UV
volume (literature)	Vol.
via	via
vide infra	<i>vide infra</i>
vide supra	<i>vide supra</i>
yield (in tables)	Yield (%)

4.2 Journal Abbreviations

- Acc. Chem. Res.
Acta Biochim. Pol.
Acta Chem. Scand.
Acta Chem. Scand., Ser. A
Acta Chem. Scand., Ser. B
Acta Chim. Acad. Sci. Hung.
Acta Chim. Hung.
Acta Chim. Sin. (Engl. Ed.)
Acta Chim. Slov.
Acta Crystallogr.
Acta Crystallogr., Sect. A
Acta Crystallogr., Sect. B
Acta Crystallogr., Sect. C
Acta Pharm. Hung.
Acta Pharm. Jugosl.
Acta Pharm. Nord.
Acta Pharm. Suec.
Acta Pharm. Turc.
Acta Pol. Pharm.
Acta Univ. Palack. Olomuc.
Actual. Chim.
Actual. Chim. Ther.
Adv. Carbohydr. Chem.
Adv. Carbohydr. Chem. Biochem.
Adv. Catal.
Adv. Chem. Ser.
Adv. Cyloaddit.
Adv. Drug Res.
Adv. Exp. Med. Biol.
Adv. Free-Radical Chem. (London)
Adv. Heterocycl. Chem.
Adv. Heterocycl. Chem., Suppl. 1
Adv. Heterocycl. Chem., Suppl. 2
Adv. Inorg. Chem. Radiochem.
Adv. Mater. (Weinheim, Ger.)
Adv. Met.-Org. Chem.
Adv. Mol. Struct. Res.
Adv. Nitrogen Heterocycl.
Adv. Org. Chem.
Adv. Organomet. Chem.
Adv. Polym. Sci.
Adv. Prostaglandin, Thromboxane,
Leukotriene Res.
Adv. Protein Chem.
Adv. Silicon Chem.
Adv. Strain Org. Chem.
Adv. Strained Interesting Org. Mol.
Adv. Synth. Catal.
Adv. Ther.
Adv. Urethane Sci. Technol.
Aerosol Sci. Technol.
Afinidad
Agents Actions
Agra Univ. J. Res., Sci.
Agric. Biol. Chem.
Agrokem. Talajtan
Aldrichimica Acta
Alexandria J. Pharm. Sci.
Am. Chem. J.
Am. Heart J.
Am. J. Bot.
Am. J. Hypertens.
Am. J. Physiol.
Amino Acids
An. Asoc. Quim. Argent.
An. Fis. Quim.
An. Quim.
An. Quim. Int. Ed.
An. Quim., Ser. C
An. R. Acad. Farm.
An. R. Soc. Esp. Fis. Quim., Ser. B
An. Stiint. Univ. "Al. I. Cuza" Iasi,
Sect. 1c
An. Univ. Bucuresti, Ser. Stiint. Nat.
Anal. Biochem.
Anal. Chem.
Anal. Chim. Acta
Anal. Sci.
Analyst
Angew. Chem.
Angew. Chem. Int. Ed.
Angew. Chem. Int. Ed. Engl.
Angew. Chem. Suppl.
Angew. Makromol. Chem.
Ann. Chim. (Paris)
Ann. Chim. (Rome)
Ann. Chim. Phys.
Ann. N.Y. Acad. Sci.
Ann. Pharm. (Lemgo, Ger.)
Ann. Pharm. Fr.
Ann. Phys. (Paris)
Ann. Univ. Mariae Curie-Sklodowska,
Sect. AA: Chem.
Annu. Rep. NMR Spectrosc.
Annu. Rep. Sankyo Res. Lab.
Annu. Rev. Biochem.
Annu. Rev. Biophys. Biomol. Struct.
Annu. Rev. Mater. Sci.
Antibiot. Annu.
Antibiot. Chemother.
(Washington, D. C.)
Anti-Cancer Drug Des.
Anti-Cancer Drugs
Anticancer Res.
Antimicrob. Agents Chemother.
Antiviral Chem. Chemother.
Appl. Catal., A.
Appl. Fluoresc. Technol.
Appl. Geochem.
Appl. Microbiol. Biotechnol.
Appl. Organomet. Chem.
Appl. Phys. A
Appl. Phys. B
Appl. Phys. Lett.
Aquat. Toxicol.
Arch. Biochem. Biophys.
Arch. Gesamte Virusforsch.
Arch. Med. Res.
Arch. Microbiol.
Arch. Pharm. (Weinheim, Ger.)
Arch. Pharm. Ber. Dtsch. Pharm. Ges.
Arch. Pharmacol. Res.
Ark. Kemi
ARKIVOC
Arm. Khim. Zh.
Arzneim.-Forsch.
Asian J. Chem.
Asian J. Spectrosc.
Astrophys. J.
Aswan Sci. Technol. Bull.
Atti Accad. Naz. Lincei, Cl. Sci. Fis.,
Mat. Nat., Rend.
Atti Accad. Sci., Lett. Arti Palermo,
Parte 1
Atti V. Congr. Naz. Chim. Pura Appl.
Sardinien
Aust. J. Chem.
Azerb. Khim. Zh.
Barwniki, Srodki Pomocnicze
Basic Life Sci.
Beijing Huagong Daxue Xuebao
Beijing Yike Daxue Xuebao
Ber. Bunsen-Ges.
Ber. Dtsch. Chem. Ges.
Ber. Dtsch. Chem. Ges. A
Ber. Dtsch. Chem. Ges. B
Biocatalysis
Biochem. Biophys. Res. Commun.
Biochem. J.
Biochem. Pharmacol.
Biochem. Physiol. Pflanz.
Biochem. Prep.
Biochem. Soc. Trans.
Biochemistry
Biochim. Biophys. Acta
Bioconjugate Chem.
Biol. Akt. Soedin., Akad. Nauk SSSR
Biol. Met.
Biol. Pharm. Bull.
Biol. Trace Elem. Res.
BioMetals
Bioorg. Chem.
Bioorg. Khim.
Bioorg. Med. Chem.
Bioorg. Med. Chem. Lett.
Biopolymers
Biosci., Biotechnol., Biochem.
Biotechnol. Bioeng.
Biotechnol. Lett.
Biul. Inf.: Barwniki, Srodki Pomoc-
nicze
Boll. Chim. Farm.
Boll. Sci. Fac. Chim. Ind. Bologna
Boll. Sedute Accad. Gioenia Sci. Nat.
Catania
Bone (N.Y.)
Br. J. Cancer
Br. J. Clin. Pharmacol.
Br. J. Pharmacol.
Brennst.-Chem. (1920–1969)
Bull. Acad. Pol. Sci., Ser. Sci. Chim.
Bull. Acad. R. Belg.
Bull. Acad. Sci. USSR, Div. Chem. Sci.
(Engl. Transl.)
Bull. Chem. Soc. Jpn.
Bull. Electrochem.
Bull. Fac. Pharm. (Cairo Univ.)
Bull. Fac. Sci., Assiut Univ.
Bull. Inst. Chem. Res., Kyoto Univ.
Bull. Korean Chem. Soc.
Bull. Pol. Acad. Sci., Chem.
Bull. Sci. (Cons. Acad. RSF Yougosl.)
Bull. Soc. Chim. Belg.
Bull. Soc. Chim. Biol.
Bull. Soc. Chim. Fr.
Bull. Soc. Chim. Romania
Bull. Soc. R. Sci. Liege

Bull. Univ. Osaka Prefect., Ser. A	Chem.-Ztg.	Dokl. Akad. Nauk UzSSR
Burns	ChemBioChem	Dokl. Bolg. Akad. Nauk
C. R. (Dokl.) Acad. Sci. URSS	Chemical Industries (Dekker)	Dokl. Chem. (Engl. Transl.)
C. R. Acad. Sci., Ser. IIb	Chemistry & Biodiversity	Dokl. Vses. Konf. Khim. Atsetilena, 4th
C. R. Hebd. Seances Acad. Sci.	Chemistry (Rajkot, India)	Dokl.-Akad. Nauk Az. SSR
C. R. Seances Acad. Sci., Ser. 2	Chemosphere	Dopov. Akad. Nauk Ukr. RSR, Ser. B:
C. R. Seances Acad. Sci., Ser. 3	Chemother. J.	Geol., Khim. Biol. Nauki
C. R. Seances Acad. Sci., Ser. C	Chemotherapy (Basel)	Drug Des. Discovery
Calcif. Tissue Int.	Chemtracts	Drug Dev. Res.
Can. J. Biochem.	Chemtracts: Org. Chem.	Drug Metab. Dispos.
Can. J. Chem.	Chemtronics	Drugs
Can. J. Chem. Eng.	Chim. Acta Turc.	Drugs Exp. Clin. Res.
Can. J. Phys.	Chim. Chron.	Drugs Future
Can. J. Spectrosc.	Chim. Ind. (Milan)	Dtsch. Apoth. Ztg.
Can. Med. Assoc. J.	Chim. Oggi	Dyes Pigm.
Cancer Chemother. Pharmacol.	Chim. Ther.	
Cancer Invest.	Chimia	Egypt. J. Chem.
Cancer Lett.	Chin. Chem. Lett.	Egypt. J. Pharm. Sci.
Cancer Res.	Chin. J. Chem.	Eisei Shikensho Hokoku
Carbohydr. Res.	Chirality	Electrochem. Commun.
Carcinogenesis	Chromatography	Electrochim. Acta
Catal. Lett.	Circ.-Calif. Agric. Exp. Stn.	Elektrokhimiya
Catal. Org. React.	Clin. Cancer Res.	Enantiomer
Catal. Rev.	Clin. Colorectal Cancer	Encycl. Polym. Sci. Technol.
Catal. Today	Clin. Exp. Allergy	Endocr. Res.
Cell Biochem. Biophys.	Clin. Pharmacol. Ther.	Energy Fuels
Cell. Mol. Biol. (Paris)	Clin. Res.	Environ. Health Perspect.
Cell. Signalling	CNS Drugs	Environ. Sci. Technol.
Cesko-Slov. Farm.	Cold Spring Harbor Symp. Quant. Biol.	Environ. Toxicol. Chem.
Chem. Abstr.	Collect. Czech. Chem. Commun.	Epilepsia
Chem. Anal. (Warsaw)	Comb. Chem. High Throughput	Eur. J. Cancer
Chem. Ber.	Screening	Eur. J. Cell Biol.
Chem. Ber./Recl.	Combust. Flame	Eur. J. Inorg. Chem.
Chem. Biol.	Comments Inorg. Chem.	Eur. J. Med. Chem.
Chem. Br.	Commun. Fac. Sci. Univ. Ankara, Ser.	Eur. J. Neurosci.
Chem. Chron. A	B: Chem. Chem. Eng.	Eur. J. Org. Chem.
Chem. Commun.	Contemp. Org. Synth.	Eur. J. Pharmacol.
Chem. Commun. (Cambridge)	Coord. Chem. Rev.	Eur. J. Phycol.
Chem. Eng. Commun.	Corsi Semin. Chim.	Eur. J. Solid State Inorg. Chem.
Chem. Eng. News	Croat. Chem. Acta	Eur. Polym. J.
Chem. Eng. Sci.	Cryst. Eng.	Eur. Urol.
Chem. Express	Cryst. Struct. Commun.	Exp. Parasitol.
Chem. Heterocycl. Compd. (Engl.	Curr. Med. Chem.	Experientia
Transl.)	Curr. Med. Chem.: Anti-Cancer Agents	Expert Opin. Pharmacother.
Chem. Ind. (London)	Curr. Opin. Oncol. Endocr. Metab. In-	Explosion
Chem. Lett.	vest. Drugs	
Chem. Listy	Curr. Org. Chem.	Faraday Discuss. Chem. Soc.
Chem. Mater.	Curr. Pharm. Des.	Farbe + Lack
Chem. News	Curr. Probl. Epilepsy	Farm. Nueva
Chem. Org. Sulfur Compd.	Curr. Sci.	Farmaco
Chem. Pap.	Curr. Ther. Res.	Farmaco, Ed. Sci.
Chem. Pharm. Bull.	Curr. Top. Phytochem.	Farmatsiya (Sofia)
Chem. Phys.		FEBS Lett.
Chem. Phys. Lett.	Dalian Ligong Daxue Xuebao	FEMS Microbiol. Lett.
Chem. Phys. Lipids	Dalton Trans.	Fette, Seifen, Anstrichm.
Chem. Prum.	Dangerous Prop. Ind. Mater. Rep.	Fiziol. Aktiv. Veshchestva, Akad. Nauk
Chem. Res. Toxicol.	Daxue Huaxue	Ukr. SSR, Respub. Mezhvedom. Sb.
Chem. Rev.	Delta J. Sci.	Food Chem.
Chem. Scr.	Diagn. Microbiol. Infect. Dis.	Food Chem. Toxicol.
Chem. Soc. Rev.	Diss. Abstr.	Food Sci. Technol. (London)
Chem. Stosow., Ser. A	Diss. Abstr. Int., B	Forensic Sci. Soc.
Chem. Technol.	Diss. Pharm.	Fortschr. Chem. Forsch.
Chem. Unserer Zeit	Doga Bilim Derg., Seri A1	Fortschr. Chem. Org. Naturst.
Chem. Weekbl.	Dokl. Akad. Nauk	Free Radical Biol. Med.
Chem. Zentralbl.	Dokl. Akad. Nauk Belarusi	Fresenius' Z. Anal. Chem.
Chem. Zvesti	Dokl. Akad. Nauk BSSR	Fuel
Chem.-Biol. Interact.	Dokl. Akad. Nauk Resp. Uzb.	Fukui Daigaku Kogakubu Kenkyu Ho-
Chem.-Eur. J.	Dokl. Akad. Nauk SSSR	koku
Chem.-Ing.-Tech.	Dokl. Akad. Nauk Ukr. SSR, Ser. B:	
	Geol., Khim. Biol. Nauki	

- Gaodeng Xuexiao Huaxue Xuebao
Gazz. Chim. Ital.
Genetika (Moscow)
Gifu Yakka Daigaku Kiyo
Glas. Hem. Drus. Beograd
Green Chem.
Guangpu Shiyanshi
Guangzhou Huagong
- Hacettepe Bull. Nat. Sci. Eng.
Handb. Exp. Pharmacol.
Han'guk Susan Hakhoechi
Helv. Chim. Acta
Herba Pol.
Heteroat. Chem.
Heterocycl. Chem.
Heterocycl. Commun.
Heterocycles
High Perform. Polym.
Hoppe-Seyler's Z. Physiol. Chem.
Horm. Metab. Res.
Huagong Jinzhan
Huaxue Shiji
Huaxue Xuebao
Hukusokan Kagaku Toronkai Koen
Yoshishu 8th
Hum. Gene Ther.
Hum. Reprod.
Hunan Daxue Xuebao, Ziran Kexue-
ban
Hung. J. Ind. Chem.
Hydrocarbon Process. Pet. Refin.
- IARC Sci. Publ.
Igong Nonjip
Ind. Chem. Libr.
Ind. Chim. Belge
Ind. Eng. Chem.
Ind. Eng. Chem. Prod. Res. Dev.
Ind. Eng. Chem. Res.
Indian J. Appl. Chem.
Indian J. Chem.
Indian J. Chem., Sect. A
Indian J. Chem., Sect. B
Indian J. Exp. Biol.
Indian J. Fibre Text. Res.
Indian J. Heterocycl. Chem.
Indian J. Nat. Prod.
Indian J. Pharm.
Indian J. Pharm. Sci.
Inf. Chim.
Inorg. Chem.
Inorg. Chem. Commun.
Inorg. Chim. Acta
Inorg. Chim. Acta, Rev.
Inorg. Nucl. Chem. Lett.
Inorg. Synth.
Int. J. Biochem.
Int. J. Chem. Kinet.
Int. J. Environ. Anal. Chem.
Int. J. Mass Spectrom. Ion Phys.
Int. J. Miner. Process.
Int. J. Mol. Med.
Int. J. Pept. Protein Res.
Int. J. Protein Res.
Int. J. Quantum Chem.
Int. J. Sulfur Chem.
Int. J. Sulfur Chem., Part A
Int. J. Sulfur Chem., Part B
Int. Prog. Urethanes
- Int. Symp. Organosilicon Chem.,
Sci. Commun. 1965
Internet J. Chem.
Intra-Sci. Chem. Rep.
Invest. New Drugs
Iran J. Chem. Chem. Eng.
Isotopenpraxis
Isr. J. Chem.
Issled. Obl. Neftekhim.
Issled. Obl. Sint. Katal. Org. Soedin.
Itsuu Kenkyusho Nempo
Izv. Akad. Nauk Gruz. SSR, Ser. Khim.
Izv. Akad. Nauk Kaz. SSR, Ser. Khim.
Izv. Akad. Nauk SSSR, Otd. Khim. Nauk
Izv. Akad. Nauk SSSR, Ser. Khim.
Izv. Akad. Nauk Turkm. SSR,
Ser. Fiz.-Mat., Tekh., Khim.
Izv. Akad. Nauk Turkm. SSR, Ser. Fiz.-
Mat., Tekh., Khim. Geol. Nauk
Izv. Akad. Nauk, Arm. SSR, Khim. Nau-
ki
Izv. Akad. Nauk, Ser. Khim.
Izv. Khim. Inst., Bulg. Akad. Nauk
Izv. Sekt. Platiny Drugikh Blagorodn.
Met. Inst. Obshch. Neorg. Khim.,
Akad. Nauk SSSR
Izv. Sib. Otd. Akad. Nauk SSSR, Ser.
Khim. Nauk
Izv. Timiryazevsk. S-kh. Akad.
Izv. Vyssh. Uchebn. Zaved., Khim.
Khim. Tekhnol.
- J. Agric. Food Chem.
J. Alloys Compd.
J. Am. Chem. Soc.
J. Am. Oil Chem. Soc.
J. Am. Pharm. Assoc.
J. Anal. Appl. Pyrolysis
J. Antibiot.
J. Antibiot., Ser. A
J. Antimicrob. Chemother.
J. Appl. Chem.
J. Appl. Chem. USSR (Engl. Transl.)
J. Appl. Crystallogr.
J. Appl. Electrochem.
J. Appl. Phys.
J. Appl. Polym. Sci.
J. Bacteriol.
J. Basic Microbiol.
J. Biochem. (Tokyo)
J. Biol. Chem.
J. Biolumin. Chemilumin.
J. Biomater. Sci., Polym. Ed.
J. Biosci. Bioeng.
J. Braz. Chem. Soc.
J. Carbohydr. Chem.
J. Carbohydr., Nucleosides,
Nucleotides
J. Catal.
J. Cell. Plast.
J. Chem. Crystallogr.
J. Chem. Ecol.
J. Chem. Educ.
J. Chem. Eng. Data
J. Chem. Inf. Comput. Sci.
J. Chem. Phys.
J. Chem. Res., Miniprint
J. Chem. Res., Synop.
J. Chem. Soc.
J. Chem. Soc. A
- J. Chem. Soc. B
J. Chem. Soc. C
J. Chem. Soc. D
J. Chem. Soc. Jpn., Ind. Chem. Sect.
J. Chem. Soc. Pak.
J. Chem. Soc., Chem. Commun.
J. Chem. Soc., Dalton Trans.
J. Chem. Soc., Faraday Trans.
J. Chem. Soc., Faraday Trans. 1
J. Chem. Soc., Faraday Trans. 2
J. Chem. Soc., Perkin Trans. 1
J. Chem. Soc., Perkin Trans. 2
J. Chem. Technol. Biotechnol.
J. Chemother. (Firenze)
J. Chim. Phys. Phys.-Chim. Biol.
J. Chin. Chem. Soc. (Taipei)
J. Chin. Inst. Chem. Eng.
J. Chromatogr.
J. Chromatogr., A
J. Clin. Invest.
J. Clin. Oncol.
J. Clin. Pharmacol.
J. Colloid Interface Sci.
J. Comb. Chem.
J. Comput. Chem.
J. Controlled Release
J. Coord. Chem.
J. Cryst. Growth
J. Cryst. Mol. Struct.
J. Crystallogr. Spectrosc. Res.
J. Drug Res.
J. Econ. Entomol.
J. Electroanal. Chem.
J. Electroanal. Chem. Interfacial Elec-
trochem.
J. Electrochem. Soc.
J. Electron Microsc.
J. Electron Spectrosc. Relat. Phenom.
J. Energ. Mater.
J. Fac. Pharm. Istanbul Univ.
J. Fac. Sci., Hokkaido Univ., Ser. 3
J. Ferment. Bioeng.
J. Fluorine Chem.
J. Food Sci.
J. Forensic Sci. Soc.
J. Gas Chromatogr.
J. Gen. Chem. USSR (Engl. Transl.)
J. Heterocycl. Chem.
J. Hypertens.
J. Inclusion Phenom.
J. Inclusion Phenom. Macrocyclic
Chem.
J. Inclusion Phenom. Mol. Recognit.
Chem.
J. Indian Chem. Soc.
J. Indian Inst. Sci.
J. Indian Inst. Sci., Sect. A
J. Inf. Rec.
J. Inf. Rec. Mater.
J. Infect. Chemother.
J. Inorg. Biochem.
J. Inorg. Nucl. Chem.
J. Insect Physiol.
J. Inst. Chem. (India)
J. Inst. Pet. Technol.
J. Karnatak Univ.
J. Korean Chem. Soc.
J. Labelled Compd.
J. Labelled Compd. Radiopharm.
J. Less-Common Met.

- J. Lumin.
 J. Macromol. Sci., Phys.
 J. Macromol. Sci., Rev. Macromol. Chem.
 J. Magn. Reson.
 J. Magn. Reson., Ser. A
 J. Mater. Chem.
 J. Mater. Sci. Mater. Electron.
 J. Med. Chem.
 J. Med. Microbiol.
 J. Med. Pharm. Chem.
 J. Mol. Catal.
 J. Mol. Catal. A: Chem.
 J. Mol. Cell. Cardiol.
 J. Mol. Model.
 J. Mol. Spectrosc.
 J. Mol. Struct.
 J. Mol. Struct. (Theochem)
 J. Nat. Prod.
 J. Natl. Cancer Inst.
 J. Neurosci.
 J. Nucl. Med.
 J. Oncol. Pharm. Pract.
 J. Opt. Soc. Am. B
 J. Org. Chem.
 J. Org. Chem. USSR (Engl. Transl.)
 J. Organomet. Chem.
 J. Organomet. Chem. Libr.
 J. Paint Technol.
 J. Pept. Res.
 J. Pept. Sci.
 J. Pestic. Sci.
 J. Pharm. Biomed. Anal.
 J. Pharm. Pharmacol.
 J. Pharm. Sci.
 J. Pharm. Soc. Jpn.
 J. Pharmacol. Exp. Ther.
 J. Photochem.
 J. Photochem. Photobiol., A
 J. Photochem. Photobiol., B
 J. Phys. Chem.
 J. Phys. Chem. A
 J. Phys. Chem. B
 J. Phys. Chem. Ref. Data
 J. Phys. Org. Chem.
 J. Plant Physiol.
 J. Polym. Sci., Part A: Polym. Chem.
 J. Polym. Sci., Part A-1
 J. Polym. Sci., Part B: Polym. Lett.
 J. Polym. Sci., Polym. Chem. Ed.
 J. Polym. Sci., Polym. Lett. Ed.
 J. Polymer Sci.
 J. Porphyrins Phthalocyanines
 J. Prakt. Chem.
 J. Prakt. Chem./Chem.-Ztg.
 J. Proc. R. Soc. N.S.W.
 J. Pure Appl. Sci.
 J. Sci. Food. Agric.
 J. Sci. Ind. Res.
 J. Sci. Ind. Res., Sect. B
 J. Sci., Islamic Repub. Iran
 J. Serb. Chem. Soc.
 J. Soc. Chem. Ind. London
 J. Soc. Cosmet. Chem.
 J. Soc. Dyers Colour.
 J. Soc. Maroc. Chim.
 J. Struct. Chem. (Engl. Transl.)
 J. Sulfur Chem.
 J. Supercrit. Fluids
 J. Synth. Org. Chem., Jpn.
 J. Teach. Res. Chem.
 J. Therm. Anal.
 J. Toxicol. Environ. Health
 J. Toxicol., Clin. Toxicol.
 J. Trace Elem. Exp. Med.
 J. Undergrad. Chem. Res.
 J. Vac. Sci. Technol., A
 J. Vasc. Res.
 Janssen Chim. Acta
 Jubilee Vol. Emil Barel
 Justus Liebig's Ann. Chem.
 K. Dan. Vidensk. Selsk., Mat.-Fys. Medd.
 Kagaku (Kyoto)
 Kagaku Gijutsu Kenkyusho Hokoku
 Kagaku Kyoiku
 Kagaku no Ryoiki
 Kagaku to Kogyo (Osaka)
 Kanazawa Daigaku Yakugakubu Kenkyu Nempo
 Katal. Sint. Org. Soedin. Sery 1979
 Kaunas Med. Inst. Darbai
 Kenkyu Hokoku-Asahi Garasu Kogyo Gijutsu Shoreikai
 Kexue Tongbao
 Khim. Geterotsikl. Soedin.
 Khim. Geterotsikl. Soedin., Sb.3
 Khim. Ind. (Sofia)
 Khim. Khim. Tekhnol. (Lvov)
 Khim. Khim. Tekhnol. (Minsk)
 Khim. Nauka Prom.
 Khim. Primen. Elementoorg. Soedin
 Khim. Prir. Soedin.
 Khim. Prom-st (Moscow)
 Khim. Prom-st, Ser.: Reakt. Osobo Chist. Veshchestva
 Khim. Seraorg. Soedin. Soderzh. Neftiyakh Nefteprod.
 Khim. Zh. Arm.
 Khim. Zh. Ural. Un-tov.
 Khim.-Farm. Zh.
 Kinet. Katal.
 Kodak Lab. Chem. Bull.
 Kogyo Kagaku Zasshi
 Kontakte (Darmstadt)
 Koord. Khim.
 Kyushu Kogyo Daigaku Kenkyu Hokoku, Kogaku
 Labdev, Part A
 Langmuir
 Latv. Kim. Z.
 Lect. Heterocycl. Chem.
 Lett. Org. Chem.
 Lett. Pept. Sci.
 Liebigs Ann.
 Liebigs Ann. Chem.
 Liebigs Ann./Recl.
 Life Sci.
 Liq. Cryst.
 Macromol. Chem. Phys.
 Macromol. Rapid Commun.
 Macromol. Rep.
 Macromol. Symp.
 Macromolecules
 Magn. Reson. Chem.
 Magn. Reson. Med.
 Magy. Kem. Foly.
 Main Group Chem.
 Main Group Chem. News
 Main Group Met. Chem.
 Makromol. Chem.
 Makromol. Chem., Macromol. Symp.
 Makromol. Chem., Rapid Commun.
 Mansoura J. Pharm. Sci.
 Manuf. Chem. Aerosol News
 Mater. Chem. Phys.
 Mater. Lett.
 Mater. Sci. Eng., C
 Mech. React. Sulfur Compd.
 Med. Chem. (New York)
 Med. Chem. Res.
 Med. Res. Rev.
 Melliand Textilber.
 Mendeleev Chem. J. (Engl. Transl.)
 Mendeleev Commun.
 Met.-Based Drugs
 Metalloorg. Khim.
 Methods Enzymol.
 Methods Mol. Biol. (Totowa, N.J.)
 Methods Plant Biochem.
 Microporous Mesoporous Mater.
 Mikrochim. Acta
 Molbank
 Mol. Cryst. Liq. Cryst.
 Mol. Cryst. Liq. Cryst. Sci. Technol., Sect. A
 Mol. Online
 Mol. Pharmacol.
 Mol. Photochem.
 Mol. Phys.
 Mol. Phys. Rep.
 Mol. Simul.
 Molecules
 Monatsh. Chem.
 Monsanto Tech. Rev.
 Moscow Univ. Chem. Bull. (Engl. Transl.)
 Mutagenesis
 Mutat. Res.
 Nachr. Chem., Tech. Lab.
 Nat. Prod. Rep.
 Natl. Acad. Sci. Lett. (India)
 Nature (London)
 Naturwissenschaften
 Nauchn. Byull. Leningr. Gos. Univ.
 Nauchn. Dokl. Vyssh. Shk., Khim. Khim. Tekhnol.
 Naunyn-Schmiedeberg's Arch. Pharmacol.
 Neuroendocrinology
 Neuropharmacology
 New J. Chem.
 Nikkakyo Geppo
 Nippon Kagaku Kaishi
 Nippon Kagaku Zasshi
 Nippon Nogei Kagaku Kaishi
 Nippon Noyaku Gakkaishi
 Nippon Shokuhin Kogyo Gakkaishi
 Nouv. J. Chim.
 Nova Acta Leopold.
 Nucl. Med. Biol.
 Nucleic Acid Chem.
 Nucleic Acids Res.
 Nucleic Acids Symp. Ser.
 Nucleosides Nucleotides

- Nucleosides, Nucleotides Nucleic Acids
Nuovo Cimento
- Oil & Soap
Oncogene
Oncol. Rep.
Oncology
Opt. Commun.
Opt. Lett.
Opt. Mater. (Amsterdam)
Opuscula
Org. Biomol. Chem.
Org. Chem. Bull.
Org. Chem. Ind. (USSR)
Org. Compd. Sulphur, Selenium, Tellurium
Org. Geochem.
Org. Khim.
Org. Lett.
Org. Magn. Reson.
Org. Mass Spectrom.
Org. Photochem. Synth.
Org. Prep. Proced. Int.
Org. Process Res. Dev.
Org. React. (N.Y.)
Org. Synth.
Org. Synth., Coll. Vol. I
Org. Synth., Coll. Vol. II
Org. Synth., Coll. Vol. III
Org. Synth., Coll. Vol. IV
Org. Synth., Coll. Vol. IX
Org. Synth., Coll. Vol. V
Org. Synth., Coll. Vol. VI
Org. Synth., Coll. Vol. VII
Org. Synth., Coll. Vol. VIII
Organomet. Chem.
Organomet. Chem. Rev.
Organomet. Chem. Rev., Sect. A
Organomet. Chem. Synth.
Organomet. Chem. USSR (Engl. Transl.)
Organomet. React.
Organometallic Syntheses
Organometallics
Orient. J. Chem.
Osteoporosis Int.
- Pak. J. Sci. Ind. Res.
Panminerva Med.
Parfums, Cosmet., Aromes
Pept. Res.
Peptides (N.Y.)
Pestic. Sci.
Pet. Chem.
Pharm. Acta Helv.
Pharm. Bull.
Pharm. Chem. J. (Engl. Transl.)
Pharm. Int.
Pharm. Pharmacol. Lett.
Pharm. Res.
Pharm. Unserer Zeit
Pharm. Zentralhalle
Pharmacol. Toxicol. (Oxford, U.K.)
Pharmacotherapy
Pharmazie
Phases
Philos. Mag.
Philos. Trans. R. Soc. London
Philos. Trans. R. Soc. London, Ser. B
- Phosphodiesterase Inhibitors
Phosphorus Relat. Group V Elem.
Phosphorus Sulfur Relat. Elem.
Phosphorus, Sulfur Silicon Relat. Elem.
Photochem. Photobiol.
Photochem. Photobiol. Sci.
Photochemistry
Photogr. Sci. Eng.
Phys. Chem. Chem. Phys.
Phys. Methods Heterocycl. Chem.
Phys. Rev. B: Condens. Matter Mater. Phys.
Phys. Status Solidi
Physica
Physica B
Phytochemistry
Phytopathology
Phytother. Res.
Planta Med.
Plast. Reconstr. Surg.
Platinum Met. Rev.
Pol. J. Chem.
Pol. J. Pharmacol. Pharm.
Polyhedron
Polym. Adv. Technol.
Polym. Bull. (Berlin)
Polym. Degrad. Stab.
Polym. Mater. Sci. Eng.
Polym. Photochem.
Polym. Prepr. (Am. Chem. Soc., Div. Polym. Chem.)
Polym. Sci. USSR (Engl. Transl.)
Polym. Sci., Ser. A
Polym. Sci., Ser. B
Polymer
Polymer (Korea)
Polymer J. (Tokyo)
Prep. Inorg. React.
Prepr.-Am. Chem. Soc., Div. Pet. Chem.
Primates
Proc. - R. Soc. Edinburgh, Sect. A
Proc. Chem. Soc., London
Proc. Combust. Inst.
Proc. ECSOC-4
Proc. Iowa Acad. Sci.
Proc. Natl. Acad. Sci. U.S.A.
Proc. R. Ir. Acad., Sect. B
Proc. R. Soc. London, Ser. A
Proc. SPIE-Int. Soc. Opt. Eng.
Proc.-Electrochem. Soc.
Proc.-Indian Acad. Sci., Chem. Sci.
Proc.-Indian Acad. Sci., Sect. A
Proc.-R. Soc. Edinburgh, Sect. A
Prog. Chem. Org. Nat. Prod.
Prog. Heterocycl. Chem.
Prog. Inorg. Chem.
Prog. Med. Chem.
Prog. Nucl. Magn. Reson. Spectrosc.
Prog. Org. Coat.
Prog. Phys. Org. Chem.
Prog. Polym. Sci.
Prog. React. Kinet.
Prog. Surf. Sci.
Propellants, Explos., Pyrotech.
Protein Eng.
Protein Pept. Lett.
Protein Sci.
Przegl. Wlok.
- Przem. Chem.
Pteridine Chem., Proc. Int. Symp., 3rd, 1962
Pteridines
Pure Appl. Chem.
Q. J. Indian Chem. Soc.
Q. Rep. Sulfur Chem.
Q. Rev., Chem. Soc.
Quant. Struct.-Act. Relat.
Quim. Nova
Radiochem. Radioanal. Lett.
Radiochemistry (Moscow)
Radiochim. Acta
Radioisotopy
Radiokhimiya
Rapid Commun. Mass Spectrom.
React. Funct. Polym.
React. Intermed. (Wiley)
React. Kinet. Catal. Lett.
React. Polym.
Reakts. Metody Issled. Org. Soedin.
Recent Res. Dev. Org. Bioorg. Chem.
Recent Res. Dev. Pure Appl. Chem.
Recl. Trav. Chim. Pays-Bas
Recl. Trav. Chim. Pays-Bas Belg.
Recl.: J.R. Neth. Chem. Soc.
Regul. Toxicol. Pharmacol.
Rend. Accad. Sci. Fis. Mat., Naples
Rend. Ist. Lomb. Sci. Lett., Cl. Sci. Mat. Nat.
Rend. R. Ist. Lomb. Sci. Lett.
Res. Adv. Org. Chem.
Res. Chem. Intermed.
Res. Commun. Mol. Pathol. Pharmacol.
Res. Discl.
Rev. Chem. Intermed.
Rev. Chim. (Bucharest)
Rev. Chim. Miner.
Rev. Chim., Acad. Repub. Pop. Roum.
Rev. Heteroat. Chem.
Rev. Latinoam. Quim.
Rev. Pure Appl. Chem.
Rev. Roum. Chim.
Ric. Sci.
Ric. Sci., Parte 2: Sez. A
Rocz. Chem.
Roum. Chem. Q. Rev.
Rubber Chem. Technol.
Russ. Chem. Bull.
Russ. Chem. Rev. (Engl. Transl.)
Russ. J. Appl. Chem. (Engl. Transl.)
Russ. J. Bioorg. Chem. (Engl. Transl.)
Russ. J. Coord. Chem. (Engl. Transl.)
Russ. J. Gen. Chem. (Engl. Transl.)
Russ. J. Inorg. Chem. (Engl. Transl.)
Russ. J. Org. Chem. (Engl. Transl.)
S. Afr. J. Chem.
Sasebo Kogyo Koto Senmon Gakko Kenkyu Hokoku
Sb. Mater. Nauch.-Tekh. Konf. Ukrain. Zaoch. Politekh. Inst. Vltch, Kharkov
Sb. Nauchn. Tr., Kuibyshev. Ind. Inst.
Sb. Nauchn. Tr., Kuzbasskii Politekh. Inst.
Sci. Bull.-Polytech. Inst. Bucharest, Chem. Mater. Sci.

Sci. Int., (Lahore)	THEOCHEM	Yakugaku Zasshi
Sci. Pharm.	Theor. Chem. Acc.	Yaouxue Xuebao
Sci. Proc. R. Dublin Soc.	Theor. Exp. Chem. (Engl. Transl.)	Yingyong Huaxue
Sci. Sin. (Engl. Ed.)	Theor. Org. Chem.	Youji Huaxue
Sci. Sin., Ser. B (Engl. Ed.)	Thermochim. Acta	Yukagaku
Science (Washington, D. C.)	Thin Solid Films	Yuki Gosei Kagaku Kyokaiishi
Semin. Oncol.	Tohoku Yakka Daigaku Kenkyu Nempo	
Shiyou (Taipei)	Top. Catal.	Z. Anorg. Allg. Chem.
Shiyou Huagong	Top. Curr. Chem.	Z. Chem.
Shokubai	Top. Heterocycl. Syst.: Synth., React. Prop.	Z. Elektrochem.
Shokuhin Eiseigaku Zasshi	Top. Stereochem.	Z. Farben-Text.-Chem.
Shoyakugaku Zasshi	Top. Sulfur Chem.	Z. Kristallogr.
Sib. Khim. Zh.	Toxicol. Lett.	Z. Naturforsch., A
Sichuan Yixueyuan Xuebao	Toxicol. Pathol.	Z. Naturforsch., B
Silicon, Germanium, Tin Lead Compd.	Tr. IREA	Z. Naturforsch., C
Solid State Commun.	Tr. Kazan. Khim.-Tekhnol. Inst.	Z. Phys. Chem. (Leipzig)
Solid State Nucl. Magn. Reson.	Tr. L'vov. Med. Inst.	Z. Phys. Chem. (Muenchen, Ger.)
Soobshch. Akad. Nauk Gruz. SSR	Tr. Tashk. Farm. Inst.	Z. Phys. Chem., Abt. A
Sov. Prog. Chem. (Engl. Transl.)	Tr. Ural. Univ.	Z. Phys. Chem., Abt. B
Spec. Chem.	Tracer (Nagoya)	Z. Phys. D
Spectrochim. Acta	Trans. N.Y. Acad. Sci.	Zagazig, J. Pharm. Sci.
Spectrochim. Acta, Part A	Transition Met. Chem.	Zesz. Nauk. Uniw. Jagiellon., Pr. Chem.
Spectrosc. Lett.	Transition Met. Org. Synth.	Zesz. Nauk.-Politech. Lodz., Chem.
Spectroscopy (Eugene, Oreg.)	Trav. Soc. Pharm. Montpellier	Zh. Fiz. Khim.
Springer Ser. Chem. Phys.	Trends Heterocycl. Chem.	Zh. Neorg. Khim.
Stereoel. React. Met.-Act. Mol., Proc. Symp., 2nd, 1994	Trends Org. Chem.	Zh. Obshch. Khim.
Steroids	Trends Organomet. Chem.	Zh. Org. Khim.
Stroenie i Svoistva Molekul	Trends Pharmacol. Sci.	Zh. Prikl. Khim. (Leningrad)
Struct. Bonding (Berlin)	Tribol. Int.	Zh. Prikl. Khim. (S.-Peterburg)
Struct. Chem.	Turk. J. Chem.	Zh. Prikl. Spektrosk.
Stud. Biophys.		Zh. Russ. Fiz.-Khim. O-va., Chast Khim.
Stud. Nat. Prod. Chem.	U. S., Dep. Agric., Circ.	Zh. Strukt. Khim.
Stud. Org. Chem.	Uch. Zap. Kazan. Gos. Univ.	Zh. Vses. Khim. O-va. im. D. I. Mendeleeva
Stud. Phys. Theor. Chem.	Uch. Zap., Mosk. Gos. Univ. im M. V. Lomonosova	Zhongguo Jishui Paishui
Stud. Surf. Sci. Catal.	Ukr. Khim. Zh. (Russ. Ed.)	Zhongguo Kangshengsu Zazhi
Stud. Univ. Babes-Bolyai, Chem.	Ultrasonics	Zhongguo Xitu Xuebao
Stud. Univ. Babes-Bolyai, Ser. 1	Univ. Kansas Sci. Bull.	Zhongguo Yaowu Huaxue Zazhi
Studi Sassar, Sez. 2	Usp. Khim.	Zhonghua Yaouxue Zazhi
Studi Urbinati, Fac. Farm.	Uzb. Khim. Zh.	
Sulfur Lett.		
Sulfur Rep.	Versl. Gewone Vergad. Afd. Natuurkd., K. Ned. Akad. Wet.	
Suom. Kemistil. B	Vestn. Mosk. Univ.	
Supramol. Chem.	Vestn. Mosk. Univ., Ser. 2: Khim.	
Surf. Sci.	Vestn. Slov. Kem. Drus.	
Synlett	Vestsi Akad. Navuk BSSR, Ser. Khim. Navuk	
Synth. Commun.	Vysokomol. Soedin., Ser. B	
Synth. Met.		
Synth. React. Inorg. Met.-Org. Chem.		
Synthesis		
Taehan Hwahakhoe Chi	Wakayama Daigaku Kyoikugakubu	
Takeda Kenkyushoho	Kiyo, Shizen Kagaku	
Talanta	Weed Sci.	
Tanabe Seiyaku Kenkyu Nempo	Wiss. Z. Ernst-Moritz-Arndt-Univ. Greifsw., Math.-Naturwiss. Reihe	
Tap Chi Hoa Hoc	Wiss. Z. Paedagog. Hochsch. "Karl Liebknecht" Potsdam	
Targets Heterocycl. Syst.	Wiss. Z. Tech. Hochsch. Chem. Leuna-Merseburg	
Technical Reports	Wiss. Z. Univ. Rostock, Naturwiss. Reihe	
Teor. Eksp. Khim.	Wood Sci. Technol.	
Tetrahedron	Wuji Huaxue Xuebao	
Tetrahedron Lett.		
Tetrahedron, Suppl.		
Tetrahedron: Asymmetry		
Textile Chem. Color.		
Textilverdlung		
Tezisy Dokl. Nauchn. Sess. Khim. Tekhnol. Org. Soedin. Sery Sernistykh Neftei, 14th	Xenobiotica	
Tezisy Vses. Soveshch. Khim. Nitrosoedin., 5th	Xiandai Huagong	
	Yakhak Hoehchi	
	Yakugaku Kenkyu	