The Beilstein Handbook

Beilsteins Handbuch der organischen Chemie is a compilation of checked information on carbon compounds. The 4th Edition was published in 503 volumes (over 440,000 pages) from 1918 to 1998, and covered the literature on organic chemistry fairly comprehensively up to 1959.

Beilstein is shelved in the reference stacks, in the same area with Gmelin, Landolt-Börnstein, and Houben-Weyl. Red dividers mark the Basic Work and the Supplements.

The Beilstein database (via Reaxys and Crossfire) is not an exact duplication of the Handbook. Pertinent data and references were extracted from the printed Handbook to 1959 to create the database. The Handbook entries, while in highly abbreviated German, provide some textual descriptions of the synthetic chemistry that are not reflected in the online version. Conversely, there is much information later added to the database that was not included in the printed Handbook. The two formats should thus be seen as complementary rather than identical, and for this reason the print Handbook is retained in the Chemistry Library.

Arrangement

The Handbook is divided into a Basic Work (Hauptwerk, abbreviated H) and four Supplementary series (Ergänzungswerke, abbreviated E), each of which covers a specific period of literature. The Fifth Supplement (E-V) covered only selected heterocyclic compounds in the literature from 1960-1979.

<table>
<thead>
<tr>
<th>Series</th>
<th>Abbreviation</th>
<th>Vols.</th>
<th>Literature Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Work</td>
<td>H</td>
<td>1-27</td>
<td>to 1909</td>
</tr>
<tr>
<td>1st Supplement</td>
<td>E-I</td>
<td>1-27</td>
<td>1910-1919</td>
</tr>
<tr>
<td>2nd Supplement</td>
<td>E-II</td>
<td>1-27</td>
<td>1920-1929</td>
</tr>
<tr>
<td>3rd Supplement</td>
<td>E-III</td>
<td>1-16</td>
<td>1930-1939</td>
</tr>
<tr>
<td>4th Supplement</td>
<td>E-IV</td>
<td>1-16</td>
<td>1940-1959</td>
</tr>
<tr>
<td>3/4 Supplement*</td>
<td>E-III/IV</td>
<td>17-27</td>
<td>1930-1959</td>
</tr>
<tr>
<td>5th Supplement**</td>
<td>E-V</td>
<td>17-27</td>
<td>1960-1979</td>
</tr>
</tbody>
</table>

* Volumes on Heterocyclics were combined into one series for these years.
** The 5th Supplement was published in English. (The Chemistry Library stopped buying new volumes after 1990.) This Supplement has only partially been converted to the database version.
Compounds in Beilstein are arranged according to the "Beilstein System," a complex series of rules which permits every substance to be assigned one specific location in the Handbook, based on its constitution and structure. Thus, every compound has a **Volume Number** and a **System Number**, which do not change over time. Once you know these, you can search for information in the same place in all Beilstein supplements. Compounds are divided into three broad categories:

<table>
<thead>
<tr>
<th>Compound Type</th>
<th>Volumes</th>
<th>System Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acyclic (no ring)</td>
<td>1-4</td>
<td>1-449</td>
</tr>
<tr>
<td>Isocyclic (all-carbon ring(s))</td>
<td>5-16</td>
<td>450-2358</td>
</tr>
<tr>
<td>Heterocyclic (other ring(s))</td>
<td>17-27</td>
<td>2359-4720</td>
</tr>
</tbody>
</table>

Beilstein covers compounds of carbon with the following elements:

```
H  B  C  N  O  F
Li  Be  Si  P  S  Cl
Na  Mg  As  Se  Br
K  Ca  Te  I
Rb  Sr  Cs  Ba
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Compounds excluded:

- CO, CS, CO2, CS2, COS, C3O2, C3S2
- Carbonic acid and its thio analogs along with their salts with inorganic cations
- HCN, HOCN, HSCN and the corresponding iso-acids and all the metal salts and complexes of these acids
- Dicyanogene, Phosgene
- Metal salts of formic acid, acetic acid, and oxalic acid
- Peptides with >13 amino acids
- Polymers

The Beilstein System of compound classification is not easily summarized beyond this point -- refer to the accompanying user guides and charts for further details.

### Using the Beilstein Indexes

Beilstein's original indexes are divided into Formula (Formelregister) and Substance Name (Sachregister) sections. Three sets of indexes are available:

<table>
<thead>
<tr>
<th>Series covered</th>
<th>Volumes covered</th>
<th>Literature years covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Work, Suppls. 1-2</td>
<td>1-27</td>
<td>to 1929</td>
</tr>
<tr>
<td>Basic Work, Suppls. 1-4</td>
<td>1-27</td>
<td>to 1959</td>
</tr>
<tr>
<td>Suppl. 5 only</td>
<td>17-19 (incomplete)</td>
<td>1960-79</td>
</tr>
</tbody>
</table>
As a rule of thumb, use the formula indexes first, because name indexes use the German-language chemical nomenclature. The oldest index set is the best first stop, because all 27 volumes of the Basic Work and first two Supplements (H-EI-EII) are covered in a single listing. The H-EI-EIV indexes are divided by volume number, so unless you know the volume number in advance or can derive it from the System, it’s less efficient to check these first. Once you do know the volume number for your compound, you can use the later indexes to locate Beilstein citations in the 3rd and 4th Supplements as well as in the earlier series. The indexes to the 5th Supplement are in English, and compound names adhere more closely to IUPAC standards.

Below is a sample Formula index listing for the compound \( \text{C}_{26}\text{H}_{43}\text{FN}_2\text{O}_4 \), from the Formelregister of Vols. 9-11. The third entry gives the German compound name and the Handbook citation. Information on this compound will be found in volume 9 of the 3rd Supplement, page 4245. The \( \text{a} \) next to the page number refers to the first entry on that page.

\[
\begin{align*}
\text{C}_{26}\text{H}_{43}\text{ClO}_3 \\
\text{Cholan-24-säure, 3-Chlor-12-hydroxy-, äthylester} & \text{ 10 IV 792} \\
\text{C}_{16}\text{H}_{23}\text{ClNO} \\
\text{Cholan-24-säure, 23,23-Dichlor-, äthylamid} & \text{ 9 IV 1994} \\
\text{C}_{26}\text{H}_{43}\text{FN}_2\text{O}_4 \\
\text{Isophthalsäure, 4-Fluor-, bis-[3-dipropylamino-propylester]} & \text{ 9 III 4245 a} \\
\text{C}_{26}\text{H}_{43}\text{NO} \\
\text{Eicos-11-ensäure, 2-Phenyl-, amid} & \text{ 9 III 2921 b}
\end{align*}
\]

TIP: The CRC Handbook of Chemistry and Physics (older editions), the Handbook of Data on Organic Compounds, and the Aldrich Catalog can serve as useful alternative indexes to printed Beilstein. Organic compound entries in these works include a Beilstein citation, which can lead you straight into the Handbook and provide a volume number for using the H-EI-EIV volume indexes. In the Aldrich Catalog, the citation looks like: \text{Beil. 16,IV,1663; which indicates volume 16 of the 4th Supplement, page 1663.}

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**Handbook Entries**

Entries in Beilstein are highly abbreviated, and until the 5th Supplement they are in German. They begin with the German compound name, and later series also give an English systematic name. The molecular formula in Hill order comes next, followed by a code (Formel) referring to the appropriate structure diagram. The variable groups in the diagram are defined in the compound entry as X. Handbook data and/or synthesis information follows in the next paragraph - refer to the German dictionary for definitions of the abbreviations. The sample entry below shows a preparation (B.) method and the corresponding literature citation. (Beilstein's abbreviations of journal
titles can be equally cryptic - a list can usually be found in the front of the volume.) It
also gives the melting point (F) in Celsius.

At the top of every right-hand page are the Supplement and Volume numbers (9), the
System Number, reference to the corresponding pages in the same volume number of
the Basic Work, and the page number.

E III 9                     Syst. Nr. 977 / H 836-837
4245

4-Fluor-isophthalsäure, bis-[3-dipropylamino-propylester], 4-
fluoroisophthalic acid
bis[3-dipropylamino]propyl ester  C_{26}H_{43}FN_{2}O_{4}, Formel II
(X = O-[CH_{2}]_{3}-N(CH_{2}-CH_{2}CH_{3})_{2}).
Dihydrochlorid C_{26}H_{43}FN_{2}O_{4}.2HCl. B. Aus 4-Fluor-isophthalsäure-
dichlor und
3-Dipropylamino-propanol-(1) in Benzol (Posdick, Calandra,
Am. Soc. 65 [1943] 2308). --
Krystalle (aus A. + Ae.); F: 110.

From here, older and newer series can be checked without further consultation of the
indexes. Just use the volume number, System number, and Basic Work page number
(H) to move back and forth in the Handbook supplements.

Information on substances contained in the Handbook includes:

- constitution and structure
- physical and chemical properties
- occurrence and isolation
- characterization and analysis
- preparation and purification
- salts and addition compounds
- structural and energy parameters

The data provided are always accompanied by references to the source documents.

User Guides and Aids

These supporting materials are located near Beilstein:

- **Beilstein Dictionary (German -- English)**
- Beilstein's Index: Trivial Names in Systematic Nomenclature of Organic
  Chemistry.
- Contents of Beilstein: Representative Examples.
- How to Use Beilstein.
• *Stereochemical Descriptors in the Beilstein Handbook.*
• *Patterson's German-English Chemical Dictionary.*

**Links**

• [RPI Guide](#)
• [Indiana University Guide](#)
• [The Beilstein Institute](#)
• [Who was Beilstein?](#)