



## Chemical Indexing

Chemical Indexing .....	2
Chemical Indexing – Key Facts .....	3
Chemical Indexing Roles .....	3
Table of Chemical Indexing Roles .....	3
Function Role Definitions .....	3
Indexing Example.....	4
Other Methods for Searching Chemical Information in Inspec.....	5
Inspec Thesaurus Terms.....	5
Inspec Chemical Indexing Search Guides .....	6
<i>ProQuest Dialog</i> .....	6
<i>EBSCOHost</i> .....	7
<i>Elsevier Engineering Village</i> .....	8
<i>ProQuest Academic</i> .....	9
<i>Clarivate Web of Science</i> .....	10
<i>Ovid SP</i> .....	11
<i>STN</i> .....	12
Table of Chemical Elements and Their Symbols.....	13
Table of Chemical Groups and Their Formulae .....	15
Table of Abbreviations and Their Corresponding Formulae .....	16

## Chemical Indexing

Chemical Indexing is a controlled indexing system intended to provide an effective means for the retrieval of information not normally searchable using key words alone. In this case the information referred to is the inorganic chemicals and material systems<sup>1</sup> discussed in the scientific and technical papers covered by Inspec.

Examples of Barriers to effective searching of chemical information in a database.

- Variation in formula – An author can describe substances such as Gallium Aluminium Arsenide, which is used in solid-state physics, in several ways (e.g. GaAlAs, AlGaAs etc.). This variation makes it difficult to ensure comprehensive retrieval of relevant results if relying on keyword searching alone.
- Stoichiometric and Non-Stoichiometric formula – Chemicals can be described using stoichiometric formula, where the proportions of each component is fixed (e.g. GaAlAs), or, particularly for semiconductors, non-stoichiometric formula, where the proportion of each component can be varied (e.g.  $Ga_xAl_{1-x}As$  or  $((GaAs)_{0.5}(AlAs)_{0.5})_x$ ). formulae such as these are not searchable using keywords.
- Upper-case and lower-case characters – Chemical symbols are a mixture of Upper and lower case characters. Search platforms commonly do not distinguish between these. They would see no difference between the chemical symbol for Cobalt (Co), and the chemical formula for Carbon Monoxide (CO).
- Ambiguity between chemical symbols and English words - Chemical element symbols or molecular formulae can match common English words, abbreviations and acronyms. The molecular formula for Gallium phosphide is "GaP" which is the same as the word "gap". Likewise, the Chemical symbol for Beryllium is Be, which is the same as the English verb "to be". It is also indistinguishable from the abbreviations for Boltzman Equation (BE) and Beta-Emission line (BE).

By standardizing the way inorganic chemicals are represented, and by putting this into a separate field, searchability in Inspec is greatly enhanced. Users can search using chemical symbols, optionally with the inclusion of Roles, in the Chemical Indexing field to achieve a much more complete set of highly relevant results.

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<sup>1</sup> Some organic compounds, can be searched within the uncontrolled indexing field.

## Chemical Indexing – Key Facts

For Searching Inorganic Chemicals and material systems in Inspec that are important to the topics of discussion in a document.

Use Chemical symbols and formulae to search.

Use Roles to search with increased specificity.

Find information in documents published from 1987 to the present.

## Chemical Indexing Roles

Roles can be used to limit results to chemical elements, binary systems etc.

### Table of Chemical Indexing Roles

Basic Roles	Abbreviation	Function Roles	Abbreviation
Element	EL	Adsorbate	ADS
Binary System	BIN	Dopant	DOP
System of >2 components	SS	Interface System	INT
		Surface/Substrate	SUR

### Function Role Definitions

Role	Example	Criteria
Adsorbate	CO/ads	Used for species being (ads)orbed.
Dopant	Si:P (Si doped by P)	Used for systems into which an impurity is diffused and those in which the impurity is a probe.
Interface	InGaP-InAlP	Semiconductor junctions, devices, integrated circuits, electrochemical batteries, etc.
Surface	Fe/sur	Used for surface or substrate, e.g. oxidation, corrosion, wear of iron.

## Indexing Example

Au-LiNbO<sub>3</sub> (i.e. Gold metal interfaced with Lithium Niobium Oxide). would be indexed as follows:-

- The complete system with its role is e.g. Au-LiNbO<sub>3</sub>/int
- Substances or material subsystems with their roles e.g. LiNbO<sub>3</sub>/int Au/int LiNbO<sub>3</sub>/ss Au/el
- Chemical groups with their roles e.g. NbO<sub>3</sub>/int NbO<sub>3</sub>/ss
- Chemical elements with numbers (integers and decimals only) and their roles, e.g. O<sub>3</sub>/int O<sub>3</sub>/ss
- Chemical elements with their roles, e.g. Au/int Li/int Nb/int O/int

04788290 **INSPEC Abstract Number:** A91010684

**Title:** Linear and nonlinear SH surface acoustic waves

**Controlled Indexing:** crystal surface and interface vibrations; gold; lithium compounds; surface acoustic waves

**Uncontrolled Indexing:** nonlinear SH surface acoustic waves; linear shear horizontal surface acoustic waves; envelope dark solitons; superimposed linear elastic thermodynamical interface; nonlinear dispersion relation; transverse modal behavior; Au-LiNbO<sub>3</sub>/sub 3/; LiNbO<sub>3</sub>/sub 3/ By

**Chemical Indexing:**

Au-LiNbO<sub>3</sub> int - LiNbO<sub>3</sub> int - NbO<sub>3</sub> int - Au int - Li int - Nb int - O<sub>3</sub> int - O int - LiNbO<sub>3</sub> ss - NbO<sub>3</sub> ss - Li ss - Nb ss - O<sub>3</sub> ss - O ss - Au el (Elements - 1,3,4)

LiNbO<sub>3</sub> sur - NbO<sub>3</sub> sur - Li sur - Nb sur - O<sub>3</sub> sur - O sur - LiNbO<sub>3</sub> ss - NbO<sub>3</sub> ss - Li ss - Nb ss - O<sub>3</sub> ss - O ss (Elements - 3)

Figure 1: Sample Inspec Record - selected fields

By covering all permutations in the Inspec indexing the chances of finding relevant results are maximized for the user.

E.g. References to sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) can be retrieved with any of the strategies below.:

- H<sub>2</sub>SO<sub>4</sub> - Any system where H<sub>2</sub>SO<sub>4</sub> is a component
- SO<sub>4</sub> - Any substance containing an SO<sub>4</sub> group
- H<sub>2</sub> - Any substance containing the H<sub>2</sub>
- H, S and O - Any substance containing H, S, and O

Some strategies are more specific to H<sub>2</sub>SO<sub>4</sub> than others. E.G. searching SO<sub>4</sub> would result in any compound containing a sulphate group being retrieved.

N.B. If a given system contains two elements, then it is a binary system even if one of the elements is only a very minor component like a dopant.

## Other Methods for Searching Chemical Information in Inspec

Controlled and uncontrolled can be useful for searching Chemical information. The controlled indexing field contains terms from the Inspec Thesaurus. The uncontrolled indexing field contains formulae rather than names of the substance, and uses the author's own terminology from the original document.

### Inspec Thesaurus Terms<sup>2,3,4</sup>

A thesaurus term exists for each element of the periodic table (e.g. HYDROGEN, GALLIUM, etc.).

Many terms exist for compounds (e.g. ALUMINIUM COMPOUNDS, MERCURY COMPOUNDS etc.)

Terms exist within hierarchies comprising Broader and narrower terms (e.g. ALKALI METAL COMPOUNDS, GALLIUM ARSENIDE, MIXED VALENCE COMPOUNDS, etc.)

N.B. Inspec indexers apply the most specific Thesaurus Terms they can from a hierarchy to a document. Searching a broader term such as ALKALI METALS will only retrieve records which contain general references to Alkali metals and not specific Alkali Metals such as Sodium. To retrieve records with references to all Alkali Metals it is necessary to search the Broader Terms in combination with the all of it's narrower terms.

Search ALKALI METALS to find results with general references to Alkali Metals

Search ALKALI METALS OR LITHIUM OR SODIUM OR POTASSIUM OR RUBIDIUM OR CAESIUM OR FRANCIUM to find results for all references to Alkali Metals

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<sup>2</sup> Several Inspec Vendor platforms allow thesaurus terms to be "exploded" i.e. for broader terms to be automatically searched along with its narrower terms. Consult the Inspec Thesaurus for appropriate search terms and to see whether a chosen Vendor offers the "explode" feature.

<sup>3</sup> Inspec thesaurus terms can be used to search for chemical information back to 1969

<sup>4</sup> Inspec Thesaurus Terms uses British English spelling and terminology. (e.g. search SULPHUR to retrieve results related to sulphur and sulfur, search ALUMINIUM to retrieve results related to aluminium and aluminum, etc.).

## Inspec Chemical Indexing Search Guides

### Tables of Vendor Search Examples<sup>5</sup>

Vendor Platform	Database File Name	Chemical Indexing Search Field	Chemical Indexing Roles	Search Examples
ProQuest Dialog	(1898 -> (1969 ->)	CI	EL BIN SS  ADS DOP INT SUR	Search a single component:  CI(BE - EL) CI(SI) – for the component in any role  Search multiple components within a multicomponent system:  CI("GA - SS" and "AL - SS" and "AS - SS")

<sup>5</sup> Examples shown use advanced search mode on each Vendor platform

<b>Vendor Platform</b>	<b>Database File Name</b>	<b>Chemical Indexing Search Field</b>	<b>Chemical Indexing Roles</b>	<b>Search Examples</b>
<b>EBSCOHost</b>	Inspec	CI	/EL /BIN /SS  /ADS /DOP /INT /SUR	<p>Search a single component:</p> <p>CI BE/EL CI SI - - for the component in any role</p> <p>Search multiple components within a multicomponent system:</p> <p>CI GA/SS N5 AL/SS N5 AS/SS</p> <p>where N5 indicates within the same indexing field and with up to five words between terms in any order</p>

<b>Vendor Platform</b>	<b>Database File Name</b>	<b>Chemical Indexing Search Field</b>	<b>Chemical Indexing Roles</b>	<b>Search Examples</b>
<b>Elsevier Engineering Village</b>	Inspec	WN CI	/EL /BIN /SS  /ADS /DOP /INT /SUR	<p>Search a single component:</p> <p>BE/EL WN CI SI WN CI - for the component with any role</p> <p>Search multiple components within a multicomponent system:</p> <p>(GA/SS NEAR/2 AS/SS NEAR/2 AS/SS) WN CI</p> <p>where NEAR/2 indicates within the same indexing sentence and up to 2 terms in between.</p> <p>Note: Only available in Expert search.</p>



<b>Vendor Platform</b>	<b>Database File Name</b>	<b>Chemical Indexing Search Field</b>	<b>Chemical Indexing Roles</b>	<b>Search Examples</b>
<b>ProQuest Academic</b>	Inspec	<in>CI	/EL /BIN /SS  /ADS /DOP /INT /SUR	Search a single component:  Be/EL<IN>CI Si<IN>CI – for the component with any role  Search multiple components within a multicomponent system:  (Ga/SS and Al/SS AND As)<IN>SS

<b>Vendor Platform</b>	<b>Inspec File Name</b>	<b>Chemical Indexing Search Field</b>	<b>Chemical Indexing Roles</b>	<b>Search Examples</b>
<b>Clarivate Web of Science</b>	Inspec	CH=	/EL /BIN /SS  /ADS /DOP /INT /SUR	Search a single component: CH=(Be/EL)  for the component with any role: CH(SI)  Search multiple components within a multicomponent system: CH=(GA/SS SAME AI/SS SAME AS/SS)

<b>Vendor Platform</b>	<b>Database File Name</b>	<b>Chemical Indexing Search Field</b>	<b>Chemical Indexing Roles</b>	<b>Search Examples</b>
<b>Ovid SP</b>	Inspec	.CH.	-EL -BIN -SS  -ADS -DOP -INT -SUR	<p>Search a single component:</p> <p>BE-EL.CH.SI.CH. – for the component with any role</p> <p>Search multiple components within a multicomponent system:</p> <p>(GA-SS ADJX AL-SS ADJ10 AS-SS).CH.</p> <p>where ADJ10 is a proximity operator indicating that search terms should be within X words of each other, in any order. X can be any number (e.g. where X=5 the search terms could be within 5 words of each other in any direction)</p>

Vendor Platform	Database File Name	Chemical Indexing Search Field	Chemical Indexing Roles	Chemical Indexing Search Examples
STN	Inspec	/CHI	EL BIN SS  ADS DOP INT SUR	<p>Search a single component:</p> <p>S BE EL/CHI S SI/CHI – for the component with any role.</p> <p>Search multiple components within a multicomponent system:</p> <p>S (AL SS(S)AL SS(S)AS SS)/CHI</p> <p>where (S) is a proximity operator indicating that search terms should be within the same indexing sentence.</p> <p>N.B.: Additional STN generated fields may be used, ELC for Element Count and ET for Element Terms. Use ELC to limit a search of, for example, 3 components to systems that only have 3 elements in total, i.e. 3/ELC. Use (L) to link CHI to ELC, e.g.</p> <p>S (AL SS(S)GA SS(S)AS SS)/CHI(L)3/ELC</p>

## Table of Chemical Elements and Their Symbols

Element	Symbol	Element	Symbol	Element	Symbol
Actinium	Ac	hafnium*	Hf	praseodymium	Pr
Aluminium	Al	hahnium	Ha	promethium	Pm
Americium	Am	( <i>now dubnium</i> )	( <i>now Db</i> )	protactinium	Pa
Antimony	Sb	hassium	Hs	radium	Ra
Argon	Ar	Helium	He	radon	Rn
Arsenic	As	holmium*	Ho	rhenium	Re
Astatine	At	hydrogen	H	rhodium	Rh
Barium	Ba	<i>see also</i>		roentgenium	Rg
Berkelium	Bk	<i>deuterium,</i>		rubidium	Rb
Beryllium	Be	<i>tritium</i>		ruthenium	Ru
Bohrium	Bh	indium*	In	rutherfordium	Rf
Bismuth	Bi	Iodine	I	samarium	Sm
Boron	B	Iridium	Ir	scandium*	Sc
Bromine	Br	Iron	Fe	seaborgium	Sg
Cadmium	Cd	krypton	Kr	selenium	Se
caesium*	Cs	lanthanum	La	silicon*	Si
Calcium	Ca	lawrencium	Lr	silver	Ag
californium*	Cf	lead*	Pb	sodium	Na
Carbon	C	Lithium	Li	strontium	Sr
Cerium	Ce	lutetium	Lu	sulphur	S
Chlorine	Cl	magnesium	Mg	tantalum	Ta
Chromium	Cr	manganese	Mn	technetium	Tc
cobalt*	Co	meitnerium	Mt	tellurium	Te
Copper	Cu	mendelevium	Md	terbium	Tb
Curium	Cm	mercury	Hg	thallium	Tl
deuterium	D	molybdenum	Mo	thorium	Th
<i>see also</i>		neodymium	Nd	thulium	Tm
<i>hydrogen</i>		Neon	Ne	tin*	Sn
Darmstadtium	Ds	neptunium*	Np	titanium	Ti
Dubnium	Db	nickel*	Ni	tritium	T
Dysprosium	Dy	niobium*	Nb	<i>see also</i>	
Einsteinium	Es	nitrogen	N	<i>hydrogen</i>	
Erbium	Er	nobelium*	No	tungsten	W
Europium	Eu	osmium*	Os	uranium	U
Fermium	Fm	oxygen	O	vanadium	V
Fluorine	F	palladium	Pd	xenon	Xe

<sup>6</sup>Certain element symbols when searched with the binary role, give ambiguous results, e.g. the letters c and o in a binary system could be the element cobalt within a binary system, or the binary system carbon monoxide. To differentiate the binary system, it is good practice to search both the binary system whole and one of the elements within the binary system, e.g. search CO/BIN AND C/BIN which will retrieve records where a carbon binary system is indexed, that system being CO. Alternatively combine the Chemical Indexing search with a search of the appropriate Inspec Thesaurus Term, e.g. (CO/BIN), and the thesaurus term CARBON COMPOUNDS. Searches of binary and multicomponent systems using the element symbols indicated by \* in the table above need searching this way.

<sup>7</sup> Where an element symbol or a molecular formula matches a database field label or search system proximity operator, it may be necessary to enclose the search in quotes. For example, on OCLC the title field label is TI. This is the same as the element symbol for titanium. On OCLC search it as CI: "TI" W El. See individual Vendor Inspec data sheets for details.

Francium	Fr	phosphorus	P	ytterbium*	Yb
Gadolinium	Gd	platinum	Pt	yttrium	Y
Gallium	Ga	plutonium	Pu	Zinc	Zn
Germanium	Ge	polonium*	Po	zirconium	Zr
Gold	Au	potassium	K		

## Table of Chemical Groups and Their Formulae

Chemical Group Name	Chemical Group Formula	Chemical Group Name	Chemical Group Formula
Alumina	Al <sub>2</sub> O <sub>3</sub>	iron garnet	Fe <sub>5</sub> O <sub>12</sub>
aluminium garnet	Al <sub>5</sub> O <sub>12</sub>	<i>see also ferrite</i>	
Arsenate	AsO <sub>4</sub>	Magnesite	MgO <sub>3</sub>
Arsenate	As <sub>2</sub> O <sub>3</sub>	Manganate	MnO <sub>4</sub>
Bismuthate	Bi <sub>2</sub> O <sub>3</sub>	Molybdate	MoO <sub>4</sub>
Borate	BO <sub>4</sub>	Niobite	NbO <sub>3</sub>
Borate	B <sub>2</sub> O <sub>3</sub>	Niobite	Nb <sub>2</sub> O <sub>5</sub>
Borate	B <sub>3</sub> O <sub>6</sub>	Niobite	Nb <sub>2</sub> O <sub>7</sub>
borate (per-)	BO <sub>3</sub>	Nitrate	NO <sub>3</sub>
Bromate	BrO <sub>3</sub>	Nitrite	NO <sub>2</sub>
Carbonate	CO <sub>3</sub>	phosphate (ortho-)	PO <sub>4</sub>
Carbonyl	CO	Phosphate	P <sub>2</sub> O <sub>5</sub>
chromate (di-)	Cr <sub>2</sub> O <sub>7</sub>	phosphate (pyro-)	P <sub>2</sub> O <sub>7</sub>
chromate (per-)	CrO <sub>3</sub>	Phosphite	PO <sub>3</sub>
/cyanide	CN	Phosphite	P <sub>4</sub> O <sub>12</sub>
Ferrite	Fe <sub>2</sub> O <sub>3</sub>	Selenite	SeO <sub>4</sub>
Ferrite	Fe <sub>2</sub> O <sub>4</sub>	Selenite	SeO <sub>3</sub>
Ferrite	Fe <sub>3</sub> O <sub>4</sub>	Silica	SiO <sub>2</sub>
ferrite (ortho)	FeO <sub>3</sub>	Silicate	SiO <sub>4</sub>
<i>see also iron garnet</i>		Sulphate	SO <sub>4</sub>
gallium garnet	Ga <sub>5</sub> O <sub>12</sub>	sulphate (thio-)	S <sub>2</sub> O <sub>3</sub>
garnet (aluminium)	Al <sub>5</sub> O <sub>12</sub>	Sulphite	SO <sub>3</sub>
garnet (gallium)	Ga <sub>5</sub> O <sub>12</sub>	Tantalite	TaO <sub>3</sub>
garnet (iron)	Fe <sub>5</sub> O <sub>12</sub>	Titanate	TiO <sub>3</sub>
Germanate	GeO <sub>2</sub>	Tungstate	WO <sub>3</sub>
Germanate	GeO <sub>3</sub>	Tungstate	WO <sub>4</sub>
Hydroxyl	OH	Vanadate	V <sub>2</sub> O <sub>5</sub>
hydroxyl (deuterated)	OD	vanadate (meta-)	VO <sub>3</sub>
Iodate	IO <sub>3</sub>	vanadate (ortho-)	VO <sub>4</sub>
		Zirconate	ZrO <sub>3</sub>

## Table of Abbreviations and Their Corresponding Formulae

Abbreviation	Formula	Abbreviation	Formula
ADP	$\text{NH}_4\text{N}_2\text{PO}_4$	KSP	$\text{KSnOPO}_4$
AG	$\text{Al}_5\text{O}_{12}$	KTP	$\text{KTiOPO}_4$
BBO	$\text{BaB}_2\text{O}_4$	LMN	$\text{PbMgO}_3\text{NbO}_3$
BEL	$\text{La}_2\text{Be}_2\text{O}_5$	NASI <i>or</i>	$\text{NaZrSiO}_4\text{PO}_4$
BPSG	$\text{B}_2\text{O}_3\text{-P}_2\text{O}_5\text{-SiO}_2$	NASICON	
BSG	$\text{B}_2\text{O}_3\text{-SiO}_2$	PLZT	$\text{PbLaZrO}_3\text{TiO}_3$
BSN	$\text{NaBaNb}_2\text{O}_6$	PMN	$\text{PbMgO}_3\text{NbO}_3$
BSO	$\text{Bi}_{12}\text{SiO}_{20}$	PSG	$\text{P}_2\text{O}_5\text{-SiO}_2$
DKDP	$\text{KD}_2\text{PO}_4$	PZT	$\text{PbZrO}_3\text{TiO}_3$
GG	$\text{Ga}_5\text{O}_{12}$	SBN	$\text{SrBaNb}_2\text{O}_6$
IG	$\text{Fe}_5\text{O}_{12}$	YAP	$\text{YAlO}_3$
ITO	$\text{InSnO}$	YLF	$\text{LiYF}_4$
KDP	$\text{KH}_2\text{PO}_4$	ZBLAN	$\text{ZrF}_4\text{-BaF}_2\text{-LaF}_3\text{-AlF}_3\text{-NaF}$
KNSBN	$\text{KNaSrBaNb}_2\text{O}_6$	ZBLANP	$\text{ZrF}_4\text{-BaF}_2\text{-LaF}_3\text{-AlF}_3\text{-NaF-PbF}_2$