

**STN**<sup>®</sup>

Derwent World Patents Index<sup>®</sup>  
Enhanced Polymer Indexing

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**STN** STN is available through FIZ Karlsruhe, Germany  
and Chemical Abstracts Service, U.S.A.

## Agenda

- Introduction and coverage
- Key features of polymer indexing
- Searching polymer indexing
- Essential user guides
- Search tips and indexing conventions
- Examples to try

## DWPI Enhanced Polymer Indexing

- A deep indexing system covering all important polymer related information from DWPI basic patents
  - Both generic and specific concepts are indexed
- The indexing contains additional information not present in the DWPI abstract
  - Generates unique hits compared to text searching, IPC's etc.
- Replaced "Plasdoc Coding" in 1993
  - Coverage starts from DWPI update 199332
- Searchable by subscribers\*
  - Using the /PLE field, in either WPIDS or WPIX

(\* An appropriate level of Thomson Reuters subscription is required.)

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## Example: DWPI polymer indexing

```

L1 ANSWER 1 OF 1 WPIX COPYRIGHT 2011 THOMSON REUTERS on STN
AN 2010-A01652 [201004] WPIX
TI Polishing pad for use in e.g. chemical mechanical planarization
   process has pores in polishing surfaces of polishing elements
   which are affixed to support layer to allow movement only along
   axis normal to polishing surface of elements
DC A88; P61; U11
IN JOSEPH W D
PA (MINN-C) 3M INNOVATIVE PROPERTIES CO
PI WO 2009158665 A1 20091230 (201004)
ADT WO 2009158665 A1 WO 2009-US48940 2
PRAI US 2008-75970P 20080626
PLE UPA 20100115
[1.1] 2004 G0828 G0817 D01 D12 D10 D51 D54 D56 D58 D69 D84
      C1 7A DCN: R01079 DCR: 140524; H0000; H0124-R; S9999
      S1309-R; S9999 S1605-R; P0328; P0340;
[1.2] 2004 G0102 G0022 D01 D02 D12 D10 D19 D18 D31 D51 D53
      D58 D76 D88 DCN: R00708 DCR: 368; G0828 G0817 D01
      D02 D12 D10 D51 D54 D56 D58 D84 DCN: R00806 DCR:
      129411; H0022 H0011; H0124-R; S9999 S1309-R; S9999
      S1605-R; P0328; P1741; P0351; P0362;
[1.3] 2004 D01 D02 D03 D12 D10 D51 D53 D59 D85 P0599 H0124
      B5061 DCN: R24073 DCR: 135413; S9999 S1309-R; S9999
      S1605-R;
[1.4] 2004 P1445-R F81 Si 4A; S9999 S1309-R; S9999 S1605-R;
[1.5] 2004 ND01; K9416; Q9999 Q6600; K9870 K9847 K9790;
      B9999 B4397 B4240; ND07; K9745-R; B9999 B5221 B4740;
      N9999 N6484-R N6440; K9778 K9745; N9999 N6940 N6939;
      N9999 N6291 N6268; N9999 N6315 N6268; N9999 N6086; . . . .

```

DWPI polymer indexing is searched and displayed using the PLE field.

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## Information indexed

- All polymer related information is indexed from:
  - The patent claims
  - DWPI documentation abstract
  - Claims related example(s)

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## Not covered

- Starting materials and intermediates for polymer formers and additives
- Chemical processes for catalyst production
- Generic or Markush Modifying Agents
- Starting materials, chemical processes, intermediates, or catalysts for modifying agent production
- Compounds present which are not additives, catalysts or modifying agents for the polymer
  - e.g. a cosmetic containing vitamin E and carboxymethylcellulose

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## Polymer indexing country coverage

Australia	Japan
Austria (from 199303)	Korea (from 200851)
Belgium	Netherlands (from 199301)
Canada	New Zealand (up to 200138)
China (from 200801)	Patent Cooperation Treaty (PCT)
European Patents	Research Disclosure (up to 200138)
France	South Africa
Germany (incl. DDR)	Sweden
Ireland (from 199501)	Switzerland
India (from 2005)	United Kingdom
	United States of America

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## Key features of polymer indexing (/PLE)

- Separate hierarchies (Facets) of related codes
  - Structural and Non-structural Facets
  - Each Facet has a unique code format
- Chemical aspects (fragment) codes for indexing chemical structures (polymers, additives, etc.)
- Auto-posting of codes to simplify searching
  - Up-posting of generic terms within code Facet
  - Cross-posting of related terms between Facets
- Precision linking of related terms
  - Using multiple proximity operators

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## Structural Facets (hierarchies)

	<b>CODE FORMAT</b>
<ul style="list-style-type: none"> <li>• Polymer Formers               <ul style="list-style-type: none"> <li>– i.e. monomers and condensants</li> </ul> </li> </ul>	(Rnnnnn, Gnnnn)
<ul style="list-style-type: none"> <li>• Polymer Types</li> </ul>	(Pnnnn)
<ul style="list-style-type: none"> <li>• Modified Polymers</li> </ul>	(Mnnnn)
<ul style="list-style-type: none"> <li>• Natural Polymers</li> </ul>	(Rnnnnn, Gnnnn)
<ul style="list-style-type: none"> <li>• Chemicals</li> </ul>	(Rnnnnn, Gnnnn)
<ul style="list-style-type: none"> <li>• Modifying Agents</li> </ul>	(Rnnnnn, Gnnnn)
<ul style="list-style-type: none"> <li>• Chemical Aspects               <ul style="list-style-type: none"> <li>– i.e. chemical fragment codes</li> </ul> </li> </ul>	(Dnn, Dnnn, Enn, Fnn, Fnnn)

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## Non-structural Facets (hierarchies)

	<b>CODE FORMAT</b>
<ul style="list-style-type: none"> <li>• Novelty Descriptors</li> </ul>	(NDnn)
<ul style="list-style-type: none"> <li>• Universal Terms</li> </ul>	(Knnnn)
<ul style="list-style-type: none"> <li>• Polymer Descriptors               <ul style="list-style-type: none"> <li>– e.g. thermoplastic, graft copolymer</li> </ul> </li> </ul>	(Hnnnn)
<ul style="list-style-type: none"> <li>• Shape &amp; Form               <ul style="list-style-type: none"> <li>– e.g. fibre, powder, foam</li> </ul> </li> </ul>	(Snnnn)
<ul style="list-style-type: none"> <li>• Additive Type</li> </ul>	(Annn)
<ul style="list-style-type: none"> <li>• Catalyst Type</li> </ul>	(Cnnn)

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## Non-structural Facets (hierarchies) (cont.)

	CODE FORMAT
• Chemical Processes	(Lnnnn)
• Physical Operations	(Nnnnn)
• Equipment	(Jnnnn)
• Properties	(Bnnnn)
• Polymer Applications	(Qnnnn)

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## Chemical aspects (fragment) codes

- Chemical Aspects are chemical fragment codes indexed for:
  - specific compounds (in addition to the SCN)
  - generic compounds
  - Markush structures
  - atoms incorporated into a polymer by modification
- Chemical aspects index all polymers, additives, catalysts and modifying agents
- Code format
  - Dnn, Dnnn, Enn, Fnn, Fnnn
  - element symbols & groups

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## Chemical aspects codes (cont.)

- General terms
  - e.g. organic or inorganic
- Ring systems
  - number of rings
  - atoms in rings
  - size of rings
- Broad functionality terms
  - e.g. D60 - Acid
- C-C unsaturation

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## Chemical aspects codes (cont.)

- Carbon count
- Specific functionality terms (Fnn)
  - e.g. F70 - carboxylic amide
- Acid Derivative terms (Enn)
  - e.g. E21 - terephthalic derivatives
- Elements and groups of the periodic table
  - Including generic terms for General Metal & for Transition Metal

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## Specific Compound Numbers (SCNs)

- Common fully defined compounds are indexed with their own specific codes – known as SCNs
  - Code format: Rnnnnn
  - e.g. R24001 – sodium acrylate
- The corresponding DWPI Chemistry Resource (DCR) numbers are also indexed and searchable
  - e.g. 135176 – sodium acrylate
- All polymer formers are indexed either by SCNs or generic codes (Gnnnn)

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## Auto-posting of codes

- In addition to the codes chosen by the indexer, the online record contains related codes that are automatically indexed.....
- Two types of auto-posting:
  - Up-posting
    - All broader codes further up the hierarchy from the indexed code are automatically indexed
  - Cross-posting
    - Related codes from other hierarchies are additionally indexed
- Benefit – easy generic searching

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## Example: Up-posting of codes

### Polymer Formers

**G0022 Monoolefinic**

.....

**G0260 NT Acrylics monoolefinic**

(+ G0022 auto-posted)

**G0271 NT Acrylic acids monoolefinic**

(+ G0022, G0260 auto-posted)

**G0282 NT Acrylic acid/salts**

(+ G0022, G0260, G0271 auto-posted)

**R00446 NT Acrylic acid**

(+ G0022, G0260, G0271, G0282 auto-posted)

**R24001 NT Sodium acrylate**

(+ G0022, G0260, G0271, G0282 auto-posted)

```

PLE UPA 20110302
[1.1] 2004 G0282 G0271 G0260 G0022 D01 D12 D10 D26 D51 D53 D58
D61 D83 F36 F35 Na 1A DCN: R24001 DCR: 135176; H0000; P0088;
  
```

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## Example: Cross-posting of codes

**R24001 Sodium Acrylate CH<sub>2</sub>=CHCOONa**

**All relevant chemical aspect codes are auto-posted:**

D01	Organic	F36	Monocarboxylic acid (salt)
D26	Acrylic unsaturated chain (96)	F35	Carboxylic acid (salt)
D12	Unsaturated chain	Na	Sodium
D10	Aliphatic chain	1A	Group 1A
D53	Monoolefinic unsaturation		
D51	Unsaturation containing		
D58	Terminal olefinic unsaturation		
D61	Salt/Complex		
D83	Carbon Count		

```

PLE UPA 20110302
[1.1] 2004 G0282 G0271 G0260 G0022 D01 D12 D10 D26 D51 D53 D58
D61 D83 F36 F35 Na 1A DCN: R24001 DCR: 135176; H0000; P0088;
  
```

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## Precision linking of related terms

- Each separate polymer concept is indexed with its associated terms (additives, catalysts, properties, applications, etc.) to form a “Linking group” of codes
- There may be several Linking groups included in the indexing – each Linking group represents a different polymer concept in the record
- Each Linking group is completely separated from other Linking groups in the record, maximizing precision and minimizing noise

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## Why are Linking groups important?

- **Example 1** - A patent describing a new bottle made from polyethylene terephthalate and having a cap made from polyolefin, e.g. polypropylene or ethylene copolymer.

This patent has two polymer concepts (bottle and cap) and so would be indexed as two Linking groups.

- **Example 2** - A patent for a new tri-layer film, the outermost layer is heat resistant polyamide, the middle layer is aluminium and the inner layer is impermeable PVC.

Again this patent has two polymer concepts (outer layer and inner layer), so two Linking groups would be made.

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## Three levels of linking

- All the codes within a single Linking group are linked together at **Level 3**
- **Level 2** and **Level 1** linking are used to indicate very closely related codes within a Linking group
  - e.g. “copolymer” linked to “acrylonitrile” and “butadiene”
- To search for codes from across different Linking groups (polymer concepts) the AND operator is used

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## Three levels of linking (cont.)

- **Level 3:** Widest level – a “Linking group”
  - Links related substances together
    - e.g. polymer with additive(s) or catalyst(s)
  - Links the polymer concept with properties and applications
- **Level 2:** Middle level – indexing for each substance
  - Links a compound with its function, shape or form
  - Links co-monomers together in a copolymer
- **Level 1:** Tightest level – Chemical Aspect (fragment) codes
  - Links structural fragments together within a substance

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## Three linking operators on STN

Linking level	Proximity operator
(3) (widest)	(L) Linking Group
(2) (middle)	(P) Paragraph
(1) (tightest)	(S) Sentence

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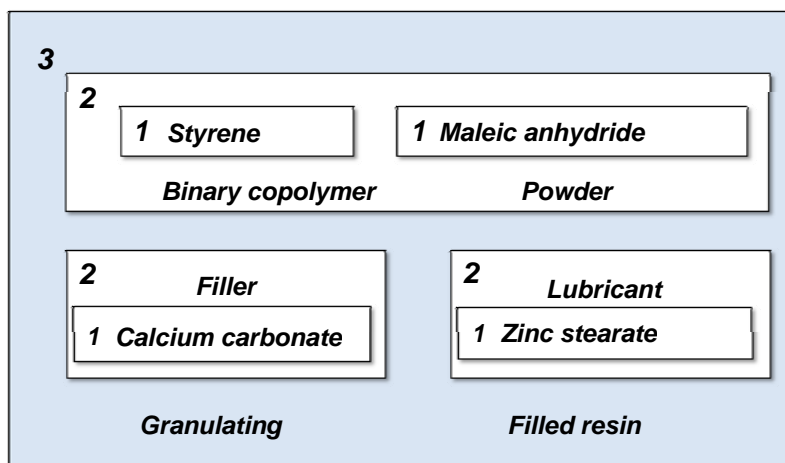
## Hypothetical linking group example

- Polymer composition
  - Styrene-maleic anhydride binary copolymer
  - Calcium carbonate filler
  - Zinc stearate lubricant
  - Granulation into a powder
- Linking diagram
  - To help visualise the linking levels
- Format for an online record
  - What the indexing would look like online
- Format for a search strategy
  - How terms would be combined with operators

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## Linking group diagram for the example



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## The linking group example as it would look indexed in DWPI

[1.1]	2004 ; <b>R00708</b> G0102 G0022 D01 D02 D12 D10 D19 D18 D31 D51 D53 D58 D76 D88 ; <b>R00843</b> G0760 G0022 D01 D23 D22 D31 D42 D51 D53 D59 D65 D75 D84 F39 E00 E01 ; <b>H0022</b> H0011 ; S9999 <b>S1514</b> S1456 ; P1741	(P)
(L) [1.2]	2004 ; N9999 <b>N6144</b> ; <b>K9449</b> (S)	
[1.3]	2004 ; <b>R01278</b> D00 F44 C- 4A O- 6A Ca 2A ; A999 <b>A237</b>	(P)
[1.4]	2004 ; <b>R01377</b> D01 D11 D10 D50 D61D95 F36 F35 Zn 2B Tr ; A999 <b>A340-R</b>	(P)

The codes shown in **bold** are those which are intellectually indexed. All others are auto-posted codes.

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## The linking group example as it would look as a search strategy

L1: => S (R00708 (P) R00843 (P) H0022 (P) S1514)/PLE

L2: => S (R01278 (P) A237)/PLE

L3: => S (R01377 (P) A340)/PLE

L4: => S (N6144 (L) K9449)/PLE

L5: => S L1 (L) L2 (L) L3 (L) L4

L1 = polymer; L2 = filler; L3 = lubricant; L4 = granulating + filled resin.

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## Linking level table

- Example – Polymer Type codes link to Additive codes at level 3

FACET	Polymer Type Pnnnn	Polymer Former Rnnnnn Gnnnn	Additive Annn	Catalyst Cnnn	Modifying Agent
<b>Polymer Descriptor</b>					
Hnnnn	2	2 2	3†	3†	3†
H0146	2	1 1	N/A	N/A	N/A
H0215	2	1 1	N/A	N/A	N/A
H0204	2	N/A 1	N/A	N/A	N/A
<b>Polymer Former</b> Rnnnnn/Gnnnn	2	2 2	3†	3†	3†
<b>Polymer Type</b> Pnnnn	AND#	2 2	3†	3†	3†
<b>Natural Polymer</b> Rnnnnn/Gnnnn	2	2 2	3†	3†	3†

Note: The full table showing linking levels for combining codes can be found in Appendix 2 of the Polymer Indexing System Description.

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## Searching for polymers

- Polymer formers
- Polymer types
- Modified polymers
- Natural polymers
- Chemical aspects

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## Addition polymers

- Addition polymers have monomer-based indexing
  - e.g. Polymethylmethacrylate:  
*methylmethacrylate + homopolymer*  
 => **S (R00479 (P) H0000)/PLE**
  - e.g. Ethylene-propylene binary copolymer:  
*ethylene + propylene + binary copolymer*  
 => **S (R00326 (P) R00964 (P) H0022)/PLE**
- Common addition polymers are also searchable as a single cross-posted polymer type code, e.g.
  - polymethylmethacrylate: => **S P0113/PLE**
  - ethylene-propylene binary copolymer: => **S P1285/PLE**

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## Condensation polymers

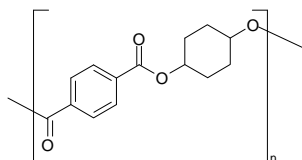
- Monomers/condensants are typically only indexed when stated in the patent
    - e.g. Polyethyleneterephthalate (PET) from ethylene glycol and terephthalic acid:
      - PET + ethylene glycol + terephthalic acid + binary copolymer*
      - => [S \(P0884\(P\)R00822\(P\)R00702\(P\)H0022\)/PLE](#)
    - PET with no further monomer/condensant details is indexed as *PET* only: => [S P0884/PLE](#)
- I.e. for all references to PET, just search P0884

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## Condensation polymers (cont.)

- When no polymer formers are stated, polymers are often indexed by structural repeat unit (SRU)
  - e.g.



Indexed as:

[\(P1978 \(2\) D01 \(2\) D14 \(2\) D19 \(2\) D32 \(2\) D76 \(2\) D50 \(2\) D93 \(2\) E21 \(2\) F90\)](#)

i.e. polyester polymer type code + chemical aspects for the repeat unit

Each chemical aspect is indexed at Level (2) to the polymer type code.

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## Condensation polymers

- If polymer formers are stated, these are indexed
  - e.g. if the polymer from the previous slide is prepared from terephthalic acid and 1,4-cyclohexane diol

### Indexed as:

(P1978 (2) R00702 (2) (G1069 (1) D01 (1) D14 (1) D31 (1) D76 (1) D50 (1) D86 (1) F28) (2) H0022)

i.e. polyester polymer type + terephthalic acid + (other diol + chemical aspects for cyclohexane diol) + binary copolymer

- For complete retrieval, search both SRU and monomer based indexing

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## Searching for additives

- Additives can be searched
  - by chemical composition
  - by function

### Triethylphosphate heat stabiliser

=> S (R00424(P)A511)/PLE

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## Searching for catalysts

- Catalysts can be searched:
  - by chemical composition
  - by type
  - by function

### Potassium persulphate free radical initiator

=> S (R01737(P)C088)/PLE

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## Building search strategies

- Create separate search statements for each component
  - for polymeric components
  - for non-polymeric components
- Combine the statements together with the appropriate proximity operators

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## Building strategies (cont.)

**Suspension copolymerisation of vinyl chloride and an alpha-olefin using sulphonate dispersant and an azo catalyst**

**Polymer:**

L1 => S (R00338 (P) G0033 (P) H0022 (P) L2675) /PLE

**Additive:**

L2 => S (A624 (P) F62) /PLE

**Catalyst:**

L3 => S (F13 (P) C293) /PLE

**Combine statements together:**

L4 => S L1 (L) L2 (L) L3

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## Polymer Indexing display formats

<b>PLE</b>	All enhanced polymer indexing
<b>HITPLE</b>	Hit polymer indexing paragraphs
<b>CODE (IND)</b>	All patent classifications, Manual Codes, DCR indexing, chemical and polymer subscriber indexing
<b>HITCODE</b>	Hit classification codes, and hit subscriber indexing paragraphs

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## Example: HITPLE display

```

=> S (R00708(P)R00806(P)H0022)/PLE
L1      22983 (R00708(P)R00806(P)H0022)/PLE

=> D BIB HITPLE

L1      ANSWER 1 OF 22983 WPIX COPYRIGHT 2011          THOMSON REUTERS on STN
AN      2011-B76997 [201115] WPIX
TI      Gel material for optical apparatus, contains transparent gel, and has
        specified hardness, penetration and repulsive force when surrounding
        surface of string-form gel material is contacted with light guide
        plate and light emitting element
DC      A89; L03; P81; Q71; U14; V07; X26
IN      MASUDA MASAHIKO; SAKURAI HIROHISA; SASAZAWA TAKAHIRO; SHIRATORI YUICHI
PA      (TAIC-N) TAICA CORP
PI      WO 2011019050 A1 20110217 (201115)* JA 98[41]
ADT     WO 2011019050 A1 WO 2010-JP63616 20100811
PRAI    JP 2010-104807          20100430
        JP 2009-187696          20090813
PLE     UPA 20110302
        [2.3] 2004 G0102 G0022 D01 D02 D12 D10 D19 D18 D31 D51 D53
                D58 D76 D88 DCN: R00708 DCR: 368; G0828 G0817 D01
                D02 D12 D10 D51 D54 D56 D58 D84 DCN: R00806 DCR:
                129411; H0022 H0011; S9999 S1365; P0328; P1741; P0351;

```

R00708 = Styrene  
R00806 = Butadiene  
H0022 = Binary copolymer

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## Essential User Guides

- Polymer Indexing System Description
- Polymer Indexing Hierarchy
- Polymer Indexing Reference Manual
- Polymer Indexing Thesaurus
- Available in print or as PDF download from:

<http://science.thomsonreuters.com/support/patents/userguides/polymerguides/>

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## Documentation 'operators'

BT	Broader Term
NT	Narrower Term
UF	Used For
USE	<i>...directs the user to the preferred code concept</i>
SEE	<i>...nearest concept available</i>
SA	See Also
(96)	Code only available from Derwent update 199601
(04)	Code only available from Derwent update 200403
(2004)	Code only available from Derwent update 200403

**Remember:** Level (1) = (S), Level (2) = (P) and Level (3) = (L).

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## Polymer Indexing Hierarchy

- Concepts grouped by hierarchy
- Codes for all the primary terms
- Narrower Terms or sub-divisions (NT)
- Used For terms (UF) to indicate synonyms
- See Also terms (SA) for other related concepts
- Scope notes "...“ to explain the use and limitation of the term

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## Example: Polymer Indexing Hierarchy

### Physical Operations

<b>N6611</b>	<b>Process control</b>
N6622	NT Automation
	UF Computer control
N6633	NT Temperature control
	SA pH control
<b>N6644</b>	<b>Purging</b>
	UF Flushing

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## Example: Polymer Indexing Hierarchy

### Chemicals

<b>R05085</b>	<b>Carbon black</b>
	UF Acetylene black
	UF Activated charcoal
	SA Carbon
	SA Graphite
<b>G2675</b>	<b>Chromium chlorides (gen)</b>
	"Used when no specific chromium chloride given"
R10690	NT Chromium (II) chloride
R01883	NT Chromium (III) chloride

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## Polymer Indexing Thesaurus

- Alphabetical listing of concepts
- All main concepts with hierarchies
- Secondary concepts (synonyms)
- Codes for both main and secondary concepts
- All relationships listed under the concepts
- Only the next level of Narrower or Broader Terms shown

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## Example: Polymer Indexing Thesaurus

A113 **Compatibility improver** [*additives*]

K9756 **Compatible polymer blend** [*universal terms*]

NT Interpenetrating network

BT Polymer blend

A124 **Complexing agent** [*additives*]

UF Chelating agent

UF Sequestering agent

**{Compliance}** [*properties*]

USE Rigidity properties B3930

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## Polymer Indexing Reference Manual

- Polymer Indexing Code list
  - alphanumeric order
  - including all autoposted terms
- Polymer Indexing Molecular formula list
  - molecular formulae for all SCNs with known structure
- Polymer Indexing Chemical Aspects - graphical definitions
  - graphical representation of certain chemical aspects

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## Searching using “-R”

- Codes that have narrow terms can either be auto-posted or manually indexed
  - these are codes at the top of a hierarchy
- When manually indexed, a “-R” suffix is added to these codes
- When auto-posted, no “-R” is added
- Searching for codes with a -R suffix will retrieve answers where the code has been manually indexed
  - auto-posted codes are not retrieved
  - the number of hits is reduced
- The Polymer Indexing Dictionary labels entries with -R as (general) and entries without -R as (all references)

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## Searching using “-R” (cont.)

### Polymer Applications hierarchy

#### Q7603 Friction materials

Q7614 NT Brakes

Q7625 NT Clutches

#### Q7636 Fuels

=> [S Q7603 /PLE](#)

- retrieves all references to friction materials, (both manually indexed and auto-posted) including all brakes and clutches

=> [S Q7603-R /PLE](#)

- retrieves only manually indexed references to generic and other friction materials, *excluding* brakes and clutches

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## Dummy codes

- Autogenerated to indicate that a code from a certain hierarchy is present

A999	Additive
B9999	Properties
C999	Catalyst
J9999	Equipment
L9999	Chemical Processes
M9999	Modified Polymers
N9999	Physical Operations
Q9999	Applications
S9999	Shape & Form

- Note that there are no Dummy Codes for polymers
- Dummy codes provide an alternative to truncation,
  - e.g. => [S A999/PLE](#) is equivalent to => [S A?/PLE](#)

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## Modified polymers & modifying agents

- Modified polymers are indexed as the original un-modified polymer plus codes to index the modification
  - All linked at Level 2 (P)
- For modifying agents to be indexed they must be specifically referred to in the patent
- Most records online containing modified polymer indexing will therefore not include modifying agents
- To search for a modifying agent
  - link the chemical SCN or chemical aspects with modifying agent code (H0226) at Level 2 (P)

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## Modifying agents & modified polymers

- To search for modified polymers
  - link the polymer with modified polymer codes (Mnnnn) at Level 2 (P)
- To link a modified polymer to a specific modifying agent
  - the modifying agent is indexed in a separate paragraph to the modified polymer, so
    - Search for the modified polymer
    - Search for the modifying agent SCN linked at Level 2 (P) to the modifying agent code (H0226)
    - Link the two search statements together at Level 3 (L)

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## Modifying agents & modified polymers example

### Brominated polyethylene – prepared by reacting bromine and polyethylene

- Search for bromine SCN as modifying agent
- Search for polyethylene + brominated polymer
- Link the searches together at Level 3 (L)

```
L1 => S (R01735 (P) H0226) /PLE
L2 => S (P1161 (P) M2233) /PLE
L3 => S L1 (L) L2
```

R01735 bromine SCN  
 H0226 modifying agent  
 P1161 polyethylene  
 M2233 brominated polymer

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## Polymerisation catalysts

- Search for the polymer which is produced using the catalyst
- Search for the catalyst type linking at Level 2 (P) to appropriate chemical aspects or SCN
- Link the polymer and catalyst search statements at Level 3 (L)

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## Polymerisation catalysts example

### Production of polyolefins using metallocene catalyst

- Search for polyolefins using the polymer type code
- Search for the metallocene catalyst
- Link the searches at Level 3 (L)

L1 => S P1150 /PLE  
 L2 => S (D62 (P) C293) /PLE  
 L3 => S L1 (L) L2

P1150 polyolefin

D62 metallocene

C293 catalyst

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## Polymer blends

- The polymer components are indexed in separate linking groups
- To search, create separate strategies for each component of the blend
  - Link each polymer at Level 3 (L) to the code for polymer blend (K9745)
- Combine the strategies with the AND operator
- This ensures that catalysts, additives, shape & form and properties are linked correctly to the relevant polymers

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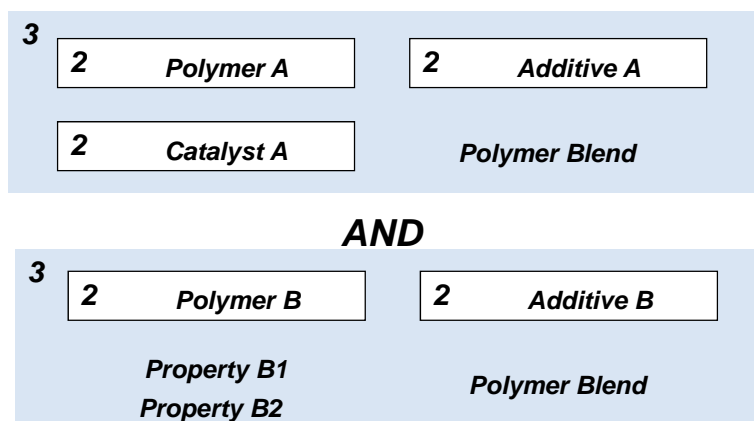
## Example: Polymer blends

- Component 1 comprising:
  - Polymer A
  - Additive A
  - Catalyst A
- Component 2 comprising:
  - Polymer B
  - Additive B
  - Property B1
  - Property B2
- Linking diagram

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## Example: Polymer blends (cont.)



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## Polymer with polymeric additive

- The polymer and polymeric additive are indexed in separate linking groups
- Create separate strategies for polymer and polymeric additive
- Combine strategies using the AND operator

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## Polymer with polymeric additive

**Example: polybutadiene roller containing PTFE powder lubricant**

```
L1 => S (R00806 (P) H0000) (L) Q8991) /PLE
L2 => S (R00975 (P) H0000 (P) A340 (P) S1514) /PLE
L3 => S L1 AND L2
```

R00806 butadiene; H0000 homopolymer  
 Q8391 roller  
 R00975 tetrafluoroethylene  
 A340 lubricant; S1514 powder

**Note:** Level 2 link between A340, R00975 and H0000.

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## Blend or polymeric additive?

- Polymer mixtures may be indexed as
  - polymer blends
  - polymeric additives to polymers
- This depends on the claimed nature of the mixture
- Search both ways to ensure complete retrieval

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## Example: Blend or polymeric additive?

- Crosslinked epoxy resin containing phenoplast
  - Could be regarded as a blend of epoxy resin and phenoplast
  - Could be regarded as an epoxy resin containing a phenoplast crosslinking agent
- Search with both possibilities in mind to maximise retrieval

L1	Epoxy resin (L) (Polymer blend or Crosslinking agent)
L2	Phenoplast (L) (Polymer blend or Crosslinking agent)
L3	L1 AND L2

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## Polymer formers versus polymer types

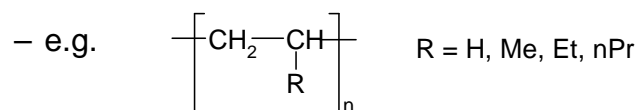
- Many polymers have terms both for
  - the polymer former
  - the polymer type
- Using the simple polymer type code will only retrieve specific polymers
  - e.g. P1343 will retrieve only the homopolymer of polypropylene
- Using the polymer former code offers more flexibility in constructing search strategies
  - E.g. => **S (R00964 (P) (H0000 OR H0011))/PLE** will retrieve propylene homo- and copolymers

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## Generic / Markush polymer formers

- A group of polymer formers is often described using a Markush diagram



- Alternatively a generic phrase is used to describe the group of polymer formers
  - e.g. 2-5C aliphatic monoolefin
- However SCNs are only indexed when the polymer former is specifically mentioned

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## Generic / Markush polymer formers

- To retrieve Markush or generic references to a specific polymer former
  - Search with an appropriate generic polymer former code
  - Link the generic code at Level 1 (S) to chemical aspects for the specific polymer former
- This is more clearly explained using an example....

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## Generic / Markush polymer formers

### All propylene polymers prepared using vanadium metallocene catalysts

L1 => S ((G0033 (S) D83) (P) (H0000 OR H0011))/PLE  
 L2 => S (C293 (P) (D62 (S) V) /PLE  
 L3 => S L1 (L) L2

G0033	(Cyclo)aliphatic monoolefinic hydrocarbons
D83	Carbon count of 3
H0000	Homopolymer
H0011	Copolymer - all references
C293	Catalyst for polymerisation through C-C unsaturation
D62	Metallocene
V	Vanadium

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## Special cases for using Level 1 linking

- Three polymer descriptor codes which are linked at Level 1 (S) to a polymer former to indicate:
  - Polymer former as a minor component (H0215)
  - Grafting polymer former (H0146)
  - Macromer as a polymer former (H0204)
- These are exceptions to the general rule that polymer formers link at Level 2 (P) to polymer descriptors

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## Polymer former as a minor component

**This is used for a polymer former which represents no greater than 10% of a copolymer.**

**E.g. Copolymer of ethylene and <5%hexene-1**

L1 => S ( H0215 (S) R02043 ) /PLE  
 L2 => S L1 (P) ( R00326 (P) H0022 ) /PLE

R02043 hexene-1  
 R00326 ethylene  
 H0215 minor component  
 H0022 binary copolymer  
 (S), (P) Level 1 and 2 links

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## Grafting polymer former

**This is used to identify the grafting monomer in a graft copolymer.  
E.g. alpha methyl styrene grafted onto styrene-isoprene copolymer**

L1 => S (H0146 (S) R00673)/PLE

L2 => S L1 (P) (R00708 (P) R00429 (P) H0033 (P) H0088 )/PLE

R00673 alpha methyl styrene

R00708 styrene; R00429 isoprene

H0146 grafting monomer

H0033 ternary or higher copolymer; H0088 graft copolymer

(S), (P) Level 1 and 2 links

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## Graft copolymers

- For graft copolymers only the final product is indexed
- Therefore in the previous example the polymer is:
  - indexed as a ternary or higher copolymer
  - not indexed as a binary copolymer of styrene and isoprene
  - but is still searchable as styrene-isoprene graft copolymer

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## Macromers

- There are two separate terms to define macromers
  - Macromer as polymer former (H0204)
    - A polymer former containing an oligomer or polymer which is modified to incorporate polymerisable functional groups
  - Macromer as modified polymer (H0191)
    - An oligomer or polymer modified to incorporate polymerisable functional groups
- Macromers are indexed in both ways to maximise retrieval

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## Macromer as polymer former

Copolymers of  $\text{CH}_2=\text{CHCOO}(\text{CH}_2\text{CH}_2\text{O})_{20}\text{H}$  and acrylic acid

**Macromer is searched as an acrylate**

L1 => S ( H0204 (S) G0373 (S) D11 (S) D95 (S) F27 (S) F34 )/PLE

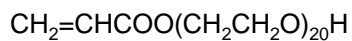
L2 => S L1 (P) ( H0011 (P) R00446 )/PLE

H0204 macromer as polymer former  
 G0373 acrylic acid ester monoolefinic, other  
 D11 saturated chain  
 D95 carbon count >25  
 F34 ether  
 F27 monoalcohol  
 H0011 copolymer - all references  
 R00446 acrylic acid

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## Macromer as modified polymer



### Regarded as a modified polyether

L1 => S ( H0191 (P) P0975 (P) R00351 (P) H0000 )/PLE  
 L2 => S L1 (P) ( M2017 (P) M2153 (P) M2186 (P) M2813 )/PLE

H0191 macromer as modified polymer  
 P0975 polyalkylene ether  
 R00351 ethylene oxide  
 H0000 homopolymer  
 M2017 acrylated polymer  
 M2153 end group modified polymer  
 M2186 esterified polymer  
 M2813 unsaturation incorporated polymer

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## Agenda

- Introduction and coverage
- Key features of polymer indexing
- Searching polymer indexing
- Essential user guides
- Search tips and indexing conventions
- Examples to try

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# Examples to try (1-8)

1. Production of tubular film with controlled thickness by extrusion blowing
2. Nylon-6 fibre used for clothing
3. Equipment for cutting plastic sheet
4. Sodium carboxymethylcellulose used in fish farming
5. Polysulphone semipermeable membrane
6. Recycling polyolefin
7. Polyamide produced from adipic acid or derivative and an aliphatic diamine
8. Water repellent coating for metal

# Examples to try (9-16)

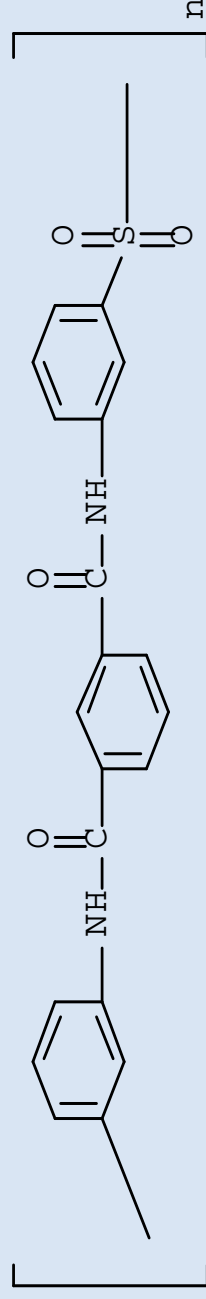
9. Mica pigment
10. Thermoplastic polymer reinforced with cellulose fibre
11. Core-sheath fibre for fishing nets
12. Tyre compositions from a mixture of polyisoprene and natural rubber
13. Apparatus for mixing filler and thermoplastic polymer
14. Trimethylolpropane triacrylate copolymer for optical discs
15. Production of polyethylene using hydrogen as a chain regulator
16. Heat resistant aromatic polyester or polyarylate

# Examples to try (17-24)

17. Catalyst for isobutylene preparation
18. Nickel catalyst for butadiene polymerisation
19. Modifying agent for acrylation of epoxy resin
20. Polymer containing biodegradable filler
21. Methylcellulose pressure sensitive adhesive
22. Triblock copolymer of isoprene and methacrylate
23. Polymeric tackifier for ethylene-propylene random copolymer
24. Aminoplast crosslinker for polyester

# Examples to try (25-29)

- 25. All references to propylene oxide
- 26. Oligomers of 1-vinylnaphthalene
- 27. All references to fluoropolymers used as antifriction coatings
- 28. Homopolymer of 2,3-dichloro-1,3-butadiene
- 29. Polymers with this SRU



# Answers to examples (1-8)

1. L1 S1296 (L) N5992 (L) B5243
2. L1 P0646 (P) S1070  
L2 L1 (L) Q7056
3. L1 J2915 (L) N6279 (L) S1581
4. L1 R07352 (L) Q7852
5. L1 P1490 (L) Q8060 (L) B4886
6. L1 P1150 (L) N6906 OR L1 G0033 (P) ( H0000 OR H0011 )  
L2 L1 (L) N6906
7. L1 G1672 (S) D10  
L2 L1 (P) P0635 (P) E13
8. L1 Q7114 (L) B3509 (L) K9552

# Answers to examples (9-16)

- 9. L1 G3010 (P) A102
- 10. L1 R01852 (P) S1070 (P) A419  
L2 L1 AND H0317
- 11. L1 S1116 (L) Q7578
- 12. L1 R00429 (P) H0000  
L2 L1 (L) K9745 (L) Q9256  
L3 R24073 (L) K9745 (L) Q9256  
L4 L2 AND L3
- 13. L1 J2915 (L) N6439 (L) H0317 (L) ( A237 OR A419 )
- 14. L1 ( H0011 (P) R05388 ) (L) Q8935
- 15. L1 R00326 (P) H0000 (P) L2573  
L2 R01532 (P) C215  
L3 L1 (L) L2
- 16. L1 B4682 (P) P0851

# Answers to examples (17-24)

17. L1 C259 (L) R00966  
L2 L1 (L) L2471
18. L1 Ni (P) C293  
L2 R00806 (P) ( L2573 OR L2528 )  
L3 L1 (L) L2
19. L1 H0226 (L) ( L2017 (P) P0464 )
20. L1 B3021 (P) A237
21. L1 R01860 (P) Q6677
22. L1 H0066 (P) R00429 (P) G0384
23. L1 ( A782 (P) A680 ) AND ( R00326 (P) R00964 (P) H0113 )
24. L1 ( A157 (P) P0259 (P) A782 ) AND P0839

# Answers to examples (25-29)

25. L1 R00370 OR ( G1558-R (S) D83 )
26. L1 G0237 (S) D20 (S) D92 (P) H0000
27. L1 P0500 OR (H0000 OR H0011 OR P0000) (P) F  
L2 L1 (L) B5367 (L) Q7114
28. L1 G0839 (S) D69 (S) D84 (S) CL (P) H0000
29. L1 "E21" (S) F61 (S) D94 (S) D33 (P) P0635 (polyamide with sulphone)  
L2 "E21" (S) F94 (S) D94 (S) D33 (P) P1490 (polysulphone with amide)  
L3 "E21" (S) D94 (S) D33 (P) P1489 (polysulphonamide)  
L4 L1 OR L2 OR L3

## Resources

- DWPI on STN User Documentation  
[http://www.stn-international.com/stn\\_dwpi.html](http://www.stn-international.com/stn_dwpi.html)
  - DWPI on STN Reference Manual
  - DWPI on STN Workshop Manual
  - DWPI Classification (DC) guide
  - Summary table of member level data coverage
  - Global Patent Sources – DWPI coverage in detail
  - Chemistry, Engineering and **Polymer User Guides**
- DWPI on STN database summary sheet  
<http://www.stn-international.com/wpindex.html>

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