

## C07F

**ACYCLIC, CARBOCYCLIC OR HETEROCYCLIC COMPOUNDS CONTAINING ELEMENTS OTHER THAN CARBON, HYDROGEN, HALOGEN, OXYGEN, NITROGEN, SULFUR, SELENIUM OR TELLURIUM (metal-containing porphyrins [C07D 487/22](#))**

### Definition statement

*This place covers:*

Pure organic compounds containing one or more of the elements B, Ge, Si, P, As, Sb and their preparation.

Pure organic compounds containing one or more metals whereby at least one metal is carbon bound, and their preparation.

Pure organic compounds containing one or more metals, without metal-carbon bonds, that can be represented by the formula: (L1)<sub>n</sub>-Metal-(L2)<sub>m</sub> (n>0 and m>0); L1 and L2 are different metal-bound moieties, and their preparation.

Zirconates and titanates, and their preparation.

In the absence of any indication to the contrary, classification is done in the last appropriate place.

### Relationships with other classification places

Polymers: Linear siloxanes are classified in [C07F](#) when they have up to six -(Si-O)- repeating units. Linear siloxanes having more than six -(Si-O)- repeating units are classified in [C08G 77/00](#). Siloxanes having endocyclic -(Si-O)- units are classified in [C07F 7/21](#).

Metal salts and metal chelates: only metal-containing compounds having a metal carbon bond or wherein the metal is attached to at least two different ligands are classified in [C07F](#). Salts, chelates, alcoholates (except Ti/Zr), phenates and the like involving a single ligand are classified as the parent compound

Salts, adducts or complexes formed between two or more organic compounds: these are classified according to all compounds forming the salts, adducts or complexes.

Mixtures, solutions: mixtures, solutions and the like of known compounds are not classified in [C07F](#), but only according to their use.

### MULTIPLE CLASSIFICATION

Biocidal, pest repellent, pest attractant, or plant growth regulatory activity of chemical compounds or preparations is further classified in [A01P](#).

Therapeutic activity of chemical compounds or medicinal preparations is further classified in subclass [A61P](#).

Uses of cosmetics or similar toilet preparations are further classified in subclass [A61Q](#).

### References

#### Limiting references

*This place does not cover:*

Inorganic compounds	<a href="#">C01B</a>
Inorganic phosphorus compounds	<a href="#">C01B 25/00</a>

## Limiting references

Inorganic silicon compounds	<a href="#">C01B 33/00</a>
Metal-containing compounds that can be represented by the formula: Metal(L) <sub>n</sub> . These compounds are classified as the parent compounds L	<a href="#">C07C</a> , <a href="#">C07D</a> , <a href="#">C07J</a> , <a href="#">C07H</a> , <a href="#">C07K</a>
Alcoholates (except titanates and zirconates)	<a href="#">C07C 31/28</a> , <a href="#">C07C 31/30</a> , <a href="#">C07C 31/32</a>
Phenates	<a href="#">C07C 39/235</a> - <a href="#">C07C 39/44</a>
Metal-containing porphyrins	<a href="#">C07D 487/22</a>
Compounds that are considered a sugar	<a href="#">C07H</a>
Sugar phosphates	<a href="#">C07H 11/04</a>
Nucleotides	<a href="#">C07H 19/00</a>
Nucleic acids	<a href="#">C07H 21/00</a>
Metal-containing sugars	<a href="#">C07H 23/00</a>
Compounds that are considered a steroid	<a href="#">C07J</a>
Compounds that are considered a peptide	<a href="#">C07K</a>
Compounds that are considered an organic macromolecular compound	<a href="#">C08</a>
Polysiloxanes	<a href="#">C08G 77/00</a>
Polysilanes	<a href="#">C08G 77/60</a>

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Pesticides	<a href="#">A01N 55/00</a>
Catalyst	<a href="#">B01J</a>
Apparatus, general methods	<a href="#">B01J</a>
General methods in organic chemistry	<a href="#">C07B</a>
Polymerization catalyst	<a href="#">C08F</a>
Polysiloxanes	<a href="#">C08G 77/00</a>
Dyes	<a href="#">C09B</a>
Coating compositions	<a href="#">C09D</a>
Electroluminescent materials	<a href="#">C09K 11/00</a>
Ionic liquids	<a href="#">C09K 23/00</a>
Deposition	<a href="#">C23C</a>
Semiconductor device	<a href="#">H01L</a>
Electroluminescent light sources	<a href="#">H05B 33/00</a>
Electroluminescent device	<a href="#">H10K 50/00</a>

## Special rules of classification

In the absence of an indication to the contrary, the Periodic Table of chemical elements referred to is the one with 18 groups as represented in the table below.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII	VIII	VIII	IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
1	H																	He
2	Li	Be											B	C	N	O	F	Ne
3	Na	Mg											Al	Si	P	S	Cl	Ar
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6	Cs	Ba	Lanthanides	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7	Fr	Ra	Actinides	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg							

Lanthanides	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Actinides	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

- In subclasses [C07C-C07K](#) and within each of these subclasses, in the absence of an indication to the contrary, a compound is classified in the last appropriate place.
- Remark about classifying a document relating to more than one of the metals for which individual subgroups have been created: when complete classification would lead to a high number of classification symbols (e.g. the compounds to be classified fall into -nearly- all of the subgroups under one and the same hierarchically higher group) classification is made under the said higher group only. Otherwise, classification is made under all appropriate subgroups, and not under the said higher group.
- In this subclass, "preparation" covers purification, separation, stabilisation or use of additives, unless a separate place is provided therefore.
- Chemical compounds and their preparation are classified in the groups for the type of compound prepared.
- If of interest, e.g. if the process relates to the preparation of known compounds and involves novel process/preparation features, the processes of preparation are also classified in the groups for the types of reaction employed. If no specific preparation class is foreseen, the preparation is classified in the class for the product obtained by the process.
- Compounds obtained by the claimed process are -as a rule- not classified (rationale is that a compound is not novel because it has been prepared by a novel process). However, if the product obtained by the process according to the invention can be considered novel, then that product should be classified (this would apply to products that can best be described by a product-by-process definition).
- General processes for the preparation of a class of compounds falling into more than one main group are classified in the groups for the processes employed, when such groups exist.
- Metal-containing compounds that do not have a metal-carbon bond but that can be represented by the formula:  $(L1)_n\text{-Metal-(L2)}_m$  ( $n>0$  and  $m>0$ ); L1 and L2 are different metal-bound moieties, and their preparation are classified in [C07F](#).
- Salts of a compound, unless specifically provided for, are classified as that compound. Carboxylic acid salts are classified as the carboxylic acid, e.g. sodium malonate is classified as malonic acid (in [C07C 55/08](#)). A mercaptide is classified as the mercaptan. Metal chelates are dealt with in the same way. Metal alcoholates and metal phenates are classified in subclass [C07C](#) and not in subclass [C07F](#).
- Salts, adducts or complexes formed between two or more organic compounds are classified according to all compounds forming the salts, adducts or complexes.
- Compounds containing unusual isotopes are classified in [C07F](#) and [C07B 59/00](#) and get the code [C07B 2200/05](#)
- [C07F](#) compounds on a support get -in addition to the [C07F](#) class- the code [C07B 2200/11](#)
- [C07F](#) compounds containing unusual isotopes are classified in [C07F](#) and in [C07B 59/00](#).

In addition to the classification in [C07F](#), a document has to be forwarded for classification to the field relating to the use or application of the compound, entity comprising the compounds (if such use or application or entity is claimed or specifically described). As an exception, the medical use ([A61K 31/00](#)) of novel compounds is not forwarded for classification. Likewise, documents relating to apparatus used in processes have to be forwarded to the appropriate fields.

## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Chelate	chemical compound consisting of a central metal atom attached by coordinate bonds to at least two non-metal atoms of a molecule, called a ligand, in a cyclic or ring structure
Metal-bound moiety	NOT: -H <sub>2</sub> O, -CN
Metallocene	chemical compound containing a metal attached to at least one cyclopentadienyl or cyclopentadienyl-derivative
Non-metals	H, B, C, Si, N, P, O, S, Se, Te, noble gases, halogens
Metals	elements other than non-metals
Metalloids	B, Si, Ge, As, Sb

## Synonyms and Keywords

*In patent documents, the following abbreviations are often used:*

LCD	Liquid Crystal Display
CVD	Chemical Vapor Deposition
OLED	Organic Light Emitting Diode
LCD	Liquid Crystal Display

*In patent documents, the following words/expressions are often used as synonyms:*

- "hydrosilation" and "hydrosilylation"

## C07F 1/00

### Compounds containing elements of Groups 1 or 11 of the Periodic Table

#### Special rules of classification

The groups [C07F 1/06](#), [C07F 1/10](#), [C07F 1/12](#) are not in use; silver, potassium, gold compounds with a metal-carbon bond are classified in [C07F 1/00](#)

Compounds without a metal-carbon bond are classified in [C07F 1/005](#).

## C07F 3/00

### Compounds containing elements of Groups 2 or 12 of the Periodic Table

#### Special rules of classification

The groups [C07F 3/04](#), [C07F 3/08](#) are not in use; calcium, cadmium compounds with a metal-carbon bond are classified in [C07F 3/00](#)

## C07F 5/00

### Compounds containing elements of Groups 3 or 13 of the Periodic Table

#### Special rules of classification

Elements of the Lanthanide series and of the Actinide series are considered as elements of Group 3 of the Periodic Table.

Boron compounds with a carbon-boron bond and a boron-nitrogen, or boron-sulfur, or a boron-halogen link are classified in the group [C07F 5/02](#).

Carboranes are classified in the group [C07F 5/027](#).

#### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Boronic acid	R-B(OH) <sub>2</sub>
Borinic acid	(R) <sub>2</sub> -B-OH
Organoborane	(R) <sub>n</sub> -B-(H) <sub>3-n</sub> with n greater than 1
Boric acid	B-(OR) <sub>3</sub>

## C07F 7/00

### Compounds containing elements of Groups 4 or 14 of the Periodic Table

#### Special rules of classification

Compounds containing elements of groups 4 or 14 of the Periodic Table, but without a metal-carbon bond, are classified in [C07F 7/003](#).

#### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Monosilicic acid	Si-(OR) <sub>4</sub>
Hydrosilylation reaction	e.g. Si-H + C=C ---> Si-C-C
Direct synthesis	Si + RX ---> (X) <sub>n</sub> -Si-(R) <sub>4-n</sub>

#### Synonyms and Keywords

*In patent documents, the following words/expressions are often used as synonyms:*

- "hydrosilation" and "hydrosilylation"
- "direct synthesis" and "Rochow synthesis"

## C07F 7/04

### Esters of silicic acids

#### Definition statement

*This place covers:*

Pure silyl esters and their preparation.

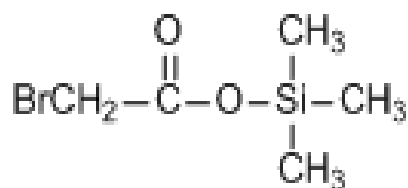
### Special rules of classification

In this group, the last place priority rule is applied, i.e. at each hierarchical level, in the absence of an indication to the contrary, classification is made in the last appropriate place.

Esters of silicic acids should be classified in this subgroup as invention only when a document claims this product and discloses experimentally its use in the specification.

If the esters of silicic acids are only disclosed as a by-product in a reaction and do not represent a main aspect of the disclosure, then this information should preferably not be classified or alternatively, be recorded as an additional classification (not invention or first).

An example of a silicic ester is shown below:



### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Monosilicic acid	Si(OH) <sub>4</sub>
Hydrosilylation reaction	e.g. Si-H + C=C ---> Si-C-C
Direct synthesis	Si + RX ---> (X) <sub>n</sub> -Si-(R) <sub>4-n</sub>

### Synonyms and Keywords

*In patent documents, the following words/expressions are often used as synonyms:*

- "hydrosilation" and "hydrosilylation"
- "direct synthesis" and "Rochow synthesis"

## C07F 9/00

### Compounds containing elements of Groups 5 or 15 of the Periodic Table

### Special rules of classification

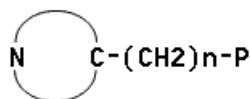
#### [C07F 9/02](#) - [C07F 9/5463](#)

- [C07F 9/02](#): is not being used.
- [C07F 9/025](#): general processes relating to purification, separation, etc.; however, a document relating to the purification, separation, etc. of a specific compound will be classified in the entry related to the substance itself.
- [C07F 9/02](#) - [C07F 9/26](#): compounds containing no P-C bonds and no heterocyclic rings.
- [C07F 9/28](#) - [C07F 9/5463](#): compounds containing P-C bonds and no heterocyclic rings.
- [C07F 9/50](#): boron adducts of organophosphines will be classified in the entry relating to the organophosphine itself.
- [C07F 9/505](#) - [C07F 9/5095](#): chemical processes relating to organophosphines; chemical processes not relating to organophosphines are classified in the entries corresponding to the compounds (product(s) (and reactant(s)/reagent(s))): if the process is general, it will be classified in the head group of the compounds, if a specific compound is prepared, the classification will be in the specific class for said compound.

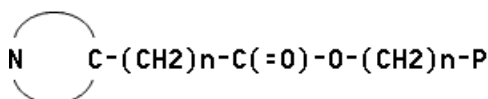
- It is noted that phosphoranes contain the structural element  $\equiv\text{P}=\text{N}-$  or  $\equiv\text{P}=\text{C}-$ .
- In general, the classification is determined by the valence and environment of the phosphorus atom; the last place rule applies.

**C07F 9/547 - C07F 9/6596**

- [C07F 9/547](#) - [C07F 9/65618](#): compounds comprising a heterocyclic ring(s), the phosphorus atom is not part of the ring; the classification is determined by the nature of the heteroring.
- [C07F 9/6564](#) - [C07F 9/6596](#): compounds comprising (a) heterocyclic ring(s) in which the phosphorus atom is part of the ring; the valence and environment of the phosphorus atom in the ring determines the classification.
- In general, the last place rule applies i.e. a compound comprising a pyridine ring and a cyclic phosphazene will be classified in the class for the phosphazene, i.e. [C07F 9/65812](#).
- [C07F 9/572](#) - [C07F 9/6521](#): The statement "the phosphorus atom is bonded to a cyclic carbon atom, other than directly, through a heteroatom, or through a hydrocarbon chain which may be broken by at least one nitrogen atom"
- relates to structures such as

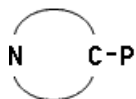


or

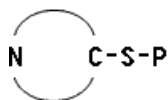


- [C07F 9/572](#) - [C07F 9/6521](#): The statement "the phosphorus atom is bonded to a cyclic carbon atom, directly or through a heteroatom other than nitrogen"

relates to structures such as

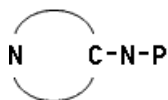


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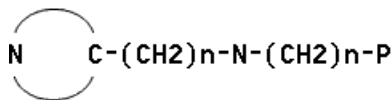


- [C07F 9/572](#) - [C07F 9/6521](#): The statement "the phosphorus atom is bonded to a cyclic carbon atom, through a nitrogen atom or through a hydrocarbon chain which is broken by at least one nitrogen atom"

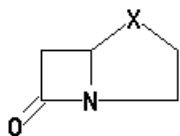
relates to structures such as



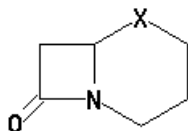
or



[C07F 9/65611](#): containing the ring system (X = CH<sub>2</sub>, O, S, NH) optionally with an additional double bond and/or substituents, e.g. penicillins and analogs.



[C07F 9/65613](#): containing the ring system (X = CH<sub>2</sub>, O, S, NH) optionally with an additional double bond and/or substituents, e.g. cephalosporins and analogs.

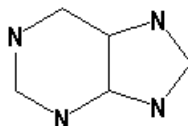


- [C07F 9/65615](#): containing a spiro condensed ring system of the formula

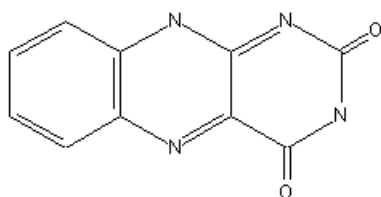


where at least one of the atoms X or Y is a heteroatom, e.g. S.

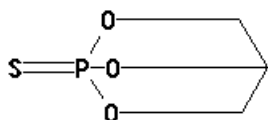
- [C07F 9/65616](#): containing the ring system, having three or more than three double bonds between ring members or between ring members and non-ring members, e.g. purine and analogues.



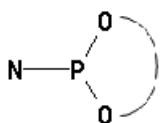
[C07F 9/65618](#): containing the ring system, e.g. flavins or analogues.



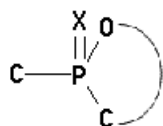
- [C07F 9/657145](#): the cyclic phosphorus atom belonging to more than one ring system, e.g.



- [C07F 9/657154](#): Cyclic esteramides of oxyacids of phosphorus, e.g.

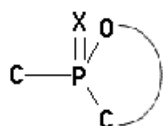


- [C07F 9/657172](#): the ring phosphorus atom and one oxygen atom being part of a (thio)phosphinic acid ester, e.g. (X = O, S).

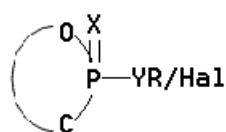


- [C07F 9/657181](#): the ring phosphorus atom and at least one ring oxygen atom being part of a (thio)phosphonic acid derivative, e.g.

or

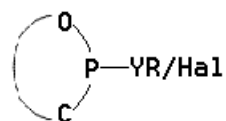


or (X = O, S; Y = O, S, N).

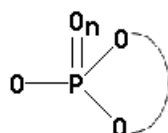


- [C07F 9/65719](#): the ring phosphorus atom at least one ring oxygen atom being part of a (thio)phosphonous acid derivative, e.g.

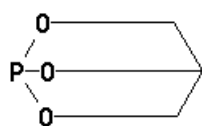
or (Y = O, S, N).



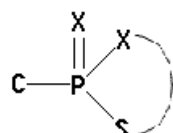
- [C07F 9/6574](#): Esters of oxyacids of phosphorus, e.g. n = 0, 1 ([C07F 9/6571](#) takes precedence).



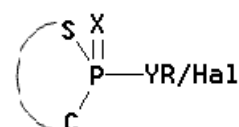
- [C07F 9/65748](#): the cyclic phosphorus atom belonging to more than one ring System, e.g.



- [C07F 9/65785](#): the ring phosphorus atom and at least one ring sulfur atom being part of a thiophosphonic acid derivative, e.g

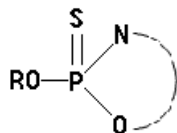


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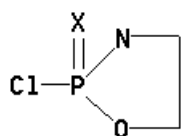


(X = O, S; Y = O, S, N).

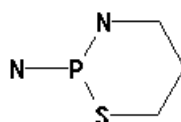
- [C07F 9/65812](#): Cyclic phosphazenes ( $\equiv P=N-$  n,  $n \geq 3$ ).
- [C07F 9/65842](#): Cyclic amide derivatives of acids of phosphorus in which one nitrogen belongs to the ring, e.g. .



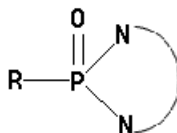
[C07F 9/65844](#): the phosphorus atom being part of a five-membered ring system which may be condensed with another ring system, e.g. .



[C07F 9/65846](#): the phosphorus atom being part of a six-membered ring system which may be condensed with another ring system, e.g. .



[C07F 9/65848](#): Cyclic amide derivatives of acids of phosphorus in which two nitrogen atoms belong to the ring, e.g. .



Bismuth compounds without a bismuth-carbon bond are classified in [C07F 9/005](#).

## C07F 15/00

### Compounds containing elements of Groups 8, 9, 10 or 18 of the Periodic Table

#### Special rules of classification

The group [C07F 15/03](#) is not in use; sideramines are classified as the parent sideramine.

#### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Platinum group	Os, Ir, Pt, Ru, Rh, Pd
Iron group	Co, Fe, Ni

## **C07F 19/00**

**Metal compounds according to more than one of main groups [C07F 1/00](#) - [C07F 17/00](#)**

### **Special rules of classification**

Documents containing at least four different metal compounds wherein the four different metals belong to four different groups of the Periodic System, or documents containing ligated metal clusters comprising four different metals wherein the metals belong to four different groups of the Periodic Table.

Furthermore, this group is an additional "invention" group, meaning that it should be given as invention information in addition to the other "invention" symbols to be assigned for the metal compounds.