

C23F

NON-MECHANICAL REMOVAL OF METALLIC MATERIAL FROM SURFACE (working metal by laser beams [B23K 26/00](#); desurfacing by applying flames [B23K 7/00](#); working of metal by electro-erosion [B23H](#); producing decorative effects by removing surface material, e.g. by engraving, by etching, [B44C 1/22](#); electrolytic etching or polishing [C25F](#)); INHIBITING CORROSION OF METALLIC MATERIAL OR INCRUSTATION IN GENERAL; MULTI-STEP PROCESSES FOR SURFACE TREATMENT OF METALLIC MATERIAL INVOLVING AT LEAST ONE PROCESS PROVIDED FOR IN CLASS [C23](#) AND AT LEAST ONE PROCESS COVERED BY SUBCLASS [C21D](#) OR [C22F](#) OR CLASS [C25](#)

Definition statement

This place covers:

Methods, compositions and apparatus for etching of metallic materials by chemical means ([C23F 1/00](#) - [C23F 1/44](#)).

Regeneration of etching compositions, including apparatus for regenerating etching agents ([C23F 1/46](#)).

Methods, compositions and apparatus for chemical polishing (brightening) of metals ([C23F 3/00](#) - [C23F 3/06](#)).

Other non-mechanical processes for removing metallic material from surfaces, e.g. by plasma or sputter etching, and compositions therefor ([C23F 4/00](#) - [C23F 4/04](#)).

Simultaneous chemical and mechanical removal of metallic material from surfaces, e.g. by laser ablation ([C23F 4/02](#), [C23F 4/04](#)).

Inhibiting corrosion of metallic material by applying inhibitors to the surface in danger of corrosion ([C23F 11/00](#) - [C23F 11/188](#)).

Inhibiting corrosion of metallic material by adding inhibitors to the corrosive agent ([C23F 11/00](#) - [C23F 11/188](#)).

Inhibiting corrosion of metals by anodic or cathodic protection ([C23F 13/00](#) - [C23F 13/22](#)).

Inhibiting incrustation in apparatus for heating liquids for physical or chemical purposes ([C23F 14/00](#)), in polymerisation reactors ([C23F 15/005](#)).

Corrosion inhibitors per se ([C23F 11/12](#) - [C23F 11/18](#)).

Incrustation inhibitors per se ([C23F 14/02](#)).

Other methods of preventing corrosion or incrustation, e.g. by removing the corrosive agent from the medium or rendering it non corrosive by neutralizing it ([C23F 15/00](#)).

Other apparatus for executing the methods mentioned above as far as they are specially adapted for treating metallic material, e.g. apparatus for regenerating etching agents; apparatus for anodic or cathodic protection, apparatus for executing the processes of the other groups, but only if they have at least one feature which is specifically designed for treating metallic material ([C23F 1/00](#), [C23F 3/00](#); [C23F 4/00](#), [C23F 13/00](#), [C23F 14/00](#), [C23F 15/00](#)).

Multi-step processes for surface treatment of metallic material involving at least one process provided for in class [C23](#) and at least one process covered by subclass [C21D](#) or [C22F](#) or class [C25](#) ([C23F 17/00](#)).

Relationships with other classification places

Protective layers or coating compositions or methods of applying them are not classified in this subclass but in the appropriate places, e.g. [B05](#), [B44](#), [C09D](#), [C10M](#), [C23C](#).

Mechanical devices or constructional features of particular articles for inhibiting incrustation are not classified in this subclass but in the appropriate places, e.g. [F16L](#) pipes or pipe fittings.

Articles characterised by being made of materials selected for their properties of resistance to corrosion or incrustation are not to be classified in this subclass but in the appropriate places for such articles, e.g. [F01D](#) turbine blades.

References

Limiting references

This place does not cover:

Methods for preventing fouling	B08B 17/00
Working of metal by electro-erosion	B23H
De-surfacing by applying flames	B23K 7/00
Working metal by laser beam	B23K 26/00
Adding scale preventives or removers to water	C02F 5/00
Polishing compositions	C09G
Etching process and compositions for silicon or germanium	C09K 13/00
Adding corrosion inhibitors to pickling solutions	C23G
Electrolytic etching or polishing	C25F

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Preventing formation of scale in cooking vessels	A47J 36/42
Producing decorative effects by removing surface material, e.g. by engraving, by etching	B44C 1/22
Mechanical methods for preventing fouling in hull protection	B63B 59/04
Application corrosion inhibitors to containers, packaging elements, or packages, for contents presenting particular transport or storage problem	B65D 81/26
Manufacture or treatment of microstructural devices or systems in or on a substrate, e.g. MEMS devices, self-assembly devices, e.g. by etching	B81C 1/00436
Preventing incrustations during destructive distillation of carbonaceous materials	C10B 43/14
Inhibition or prevention of corrosion or incrustation during processing of hydrocarbons	C10G 7/10 , C10G 9/16 , C10G 75/02
Use of additives to fuels or fires for minimising corrosion or incrustation	C10L 10/04
Adding corrosion inhibitors to lubricants	C10M , C10N 2030/12
Measures against corrosion for turbine blades	F01D 5/28
Preventing incrustation in pipes	F16L 58/00
Manufacture of two-terminal components for integrated circuits, e.g. resistors, electrodes, capacitors, inductors by etching conductive layers	H01L 28/00

Informative references

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

Repairing fractures or cracked metal parts or products	B23P 6/04
Layered products comprising a layer of metal	B32B 15/00
Manufacture of printing surfaces	B41C
Surface treatment of glass by etching	C03C 15/00 , C03C 25/68
Etching of natural or artificial stone or ceramics	C04B 41/53 , C04B 41/72 , C04B 41/91
Compositions for preventing, limiting or eliminating depositions	C09K 8/52
Compositions for in situ inhibition of corrosion in boreholes or wells	C09K 8/54
Etching, surface-brightening or pickling compositions in general, e.g. for silicon, metal nitrides, etc.	C09K 13/00
Regeneration of process liquids, e.g. of etching compositions	C25F 7/00
Portable water systems, e.g. treating plumbing systems for preventing leaching /elution of lead in water	E03B , E03B 7/09
Water supplying lines	E03C
In situ inhibition of corrosion in boreholes or wells	E21B 41/02
Preparing samples for investigations, e.g. by etching or polishing	G01N 1/32
Investigating or analysing metals by specific methods, e.g. metallographic etching	G01N 33/20
Photomechanical reproduction	G03F
Discharge tubes with the provision for introducing objects or materials to be exposed to the discharge, e.g. plasma apparatus and treatment in general (see C23F 4/00 , classification rules)	H01J 37/00
Chemical or electrical treatment, e.g. by etching, of semiconductor bodies	H01L 21/306
After treatment of semiconductor bodies, e.g. by chemical mechanical polishing of conductive layers	H01L 21/32115
After treatment of semiconductor bodies, e.g. by physical or chemical etching of conductive layers	H01L 21/3213
Apparatus for treating semiconductor bodies	H01L 21/67005
Manufacture of printed circuits	H05K

Special rules of classification

[C23F](#) does not include methods, compositions and apparatus for treatment of non metallic material.

Groups [C23F 1/00](#) - [C23F 4/04](#) are not used for classifying methods, compositions and apparatuses for etching in general.

Classification of additional information

In many cases the classification of additional information is very useful for retrieving the document, and therefore very desirable, although not compulsory.

Well-disclosed and non-trivial aspects are classified.

Well-known (trivial) aspects or features are not classified.

For example:

If a document discloses an "etching process and composition for aluminium" ([C23F 1/20](#)), which in the description is also described as being suitable "for etching magnesium", and if this additional information is per se new /inventive ("non-trivial"), it is classified, namely [C23F 1/22](#) as well.

In some cases the additional information is broadly defined as any secondary information useful for search that is not relevant per se, but that could be interesting for search when considered together with the important (invention-like) information, it is classified with (Indexing Code), e.g. "type of materials to be protected by cathodic protection" ([C23F 2201/00](#)).

Subgroups and head groups

Apparatus or processes are classified in the subgroups for apparatus /process, if such subgroups exist, if not the process /apparatus are classified in the head group.

Etching /inhibiting compositions for are classified in the specific subgroups according to the intrinsic nature /function of the mixture or composition, e.g. acidic aqueous etching composition ([C23F 1/16](#)) or alkaline aqueous etching compositions ([C23F 1/32](#)).

An "application-oriented" invention should be classified in an application-oriented place (when it exists). An "application-oriented" invention is considered as:

- a thing "specially adapted for" a particular use or purpose, e.g. an apparatus modified or particularly constructed for etching /inhibiting corrosion or incrustation/ of metallic material;
- a particular use or application of a thing; e.g. alkaline composition for etching copper or alloys thereof ([C23F 1/34](#)).

If a document concerns embodiments which are covered by several subgroups (e.g. [C23F 1/16](#) - [C23F 1/30](#)) dependent on a higher hierarchy group (head group, e.g. [C23F 1/16](#)), the following rules apply:

the specific technical information relevant for some of the subgroups is classified (EC) in all said subgroups;

if relevant, the combination of the elements covered by the subgroups is classified (EC) in the head group;

analogously, if generic technical information common to all of the subgroups is disclosed and only schematic embodiments of the specific subgroup embodiments are represented, the document is classified (EC) in the head group.

For example:

If a document discloses an acidic etching composition suitable for etching a metallic material in general, or selected from a big list of metals, without specific embodiments for the selected metals, then it is classified in the head group [C23F 1/16](#);

If a document discloses an acidic etching composition for etching copper or alloys thereof, then it is classified in [C23F 1/18](#);

Glossary of terms

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

Metallic material	covers metals and alloys
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Alloys	include: metallic composite materials containing a substantial proportion of fibres or other somewhat larger particles; ceramic compositions bonded by free metal, containing free metal bonded to carbides, diamond, oxides, borides, nitrides or silicides, e.g. cermets, or other metal compounds, e.g. oxynitrides or sulfides, other than as macroscopic reinforcing agents.
Applying corrosion inhibitors	Applying corrosion inhibitors to a metallic surface layer is not considered to be applying a protective coating.
Inhibiting corrosion	Inhibiting corrosion is a specific form of preventing corrosion, the words are not synonyms
Corrosion	Deterioration of a metallic material due to a change of valence state caused by reactions with its environment.
Incrustation	Accumulation of deposition /precipitation of undesired solid / dense products on a metallic surface in systems in which a fluid circulation takes place, preferably a water-based fluid, e.g. deposition /precipitation of compounds of calcium, magnesium, barium or strontium (carbonates/ sulphates, oxalates, phosphates, fluorides, silica, silicates, naphтеленates), iron /lead / zinc sulphide, zinc /cadmium carbonates (white rust).

Synonyms and Keywords

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

- "incrustation", "crust" , "chalk", "limescale" and "carbonate /sulfate scale", "white rust"
- "etching", "stripping", "engraving"

In patent documents, the following words/expressions are often used with the meaning indicated:

"encrustation"	" incrustation".
"fouling"	" incrustation" or "rusting".
"chemical polishing"	"brightening".

C23F 1/00

Etching metallic material by chemical means (manufacture of printing surfaces [B41C](#); manufacture of printed circuits [H05K](#))

Definition statement

This place covers:

Methods, compositions and apparatus for etching of metallic materials by chemical means.

Regeneration of etching compositions, including apparatus for regenerating etching agents ([C23F 1/46](#)).

Selective etching /dealloying of an element /phase from an alloy in order to obtain a porous surface ([C23F 1/00](#)).

Selective etching of complex structures (i.e. metallic multilayers) ([C23F 1/44](#)).

Local etching e.g. by using a photoresist mask ([C23F 1/02](#)).

Apparatus for photo-mechanical printing surface ([C23F 1/08](#)).

Emulsions compositions for etching of metallic material ([C23F 1/42](#)).

In the subgroup [C23F 1/10](#), the expression "etching composition" is used with the meaning: "etching composition for specific metals" and covers: etching composition of specific metals, and not etching composition in general;

The subgroup [C23F 1/06](#) relates to "sharpening files" (old technology).

Relationships with other classification places

Dry etching of semi-conductors are classified in [H01L 21/00](#).

Processes of etching silicon used in semiconductors applications is classified in [H01L 21/00](#).

Processes and compositions for etching silicon which are not for semiconductor applications are classified in [C09K 13/00](#)

References

Limiting references

This place does not cover:

Etching compositions of silicon or germanium	C09K 13/00
Electrolytic etching	C25F 3/02
Etching semiconductors	H01L 21/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Producing decorative effects by removing surface material, e.g. by engraving, by etching	B44C 1/22
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Informative references

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

Manufacture of printing surfaces	B41C
Surface treatment of glass by etching	C03C 15/00 , C03C 25/68
Etching of natural or artificial stone or ceramics	C04B 41/53 , C04B 41/72 , C04B 41/91
Recovering of metals from etching solutions	C22B 3/00
Regeneration of process liquids, e.g. of etching compositions	C25F 7/00
Repairing methods or devices for turbomachines	F01D 5/005
Cleaning of turbomachines	F01D 25/002
Photomechanical reproduction	G03F 7/00
Chemical etching of semiconductor bodies	H01L 21/30604
Chemical etching of semiconductor bodies by using masks	H01L 21/308
After-treatment of conductive layers, e.g. by chemical liquid etching (wet-etching)	H01L 21/32134
Semiconductor treating apparatus, e.g. for wet etching	H01L 21/67075

Manufacture of printed circuits	H05K 3/00
Chemically removing of conductive material	H05K 3/06
Etching compositions	H05K 3/067
Improving adhesion between the insulating substrate and the metal by microetching	H05K 3/383

Special rules of classification

The **C23F1/24** IPC group is not used in the internal ECLA classification scheme. Subject-matter covered by this group is classified in the following groups: [C09K 13/00](#) - [C09K 13/08](#).

See the rules for classification of invention /additional information, and examples mentioned for the subclass [C23F](#).

A selective etching composition of complex structures is classified in [C23F 1/44](#) and the specific technical information relevant for some of the subgroups ([C23F 1/14](#) - [C23F 1/40](#)) is classified in all said subgroups

For example:

If a document discloses an acidic etching composition for selectively etching a metal, such as Ta, from an aluminium substrate, then it is classified in the subgroups [C23F 1/44](#) and [C23F 1/26](#).

Processes of dry etching of metal materials by plasma are classified in [C23F 4/00](#).

Processes of dry etching of metal materials by using gases are classified in [C23F 1/12](#)

Glossary of terms

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

Chemical Etching	Removal or dissolution of metallic material from a surface by chemical reaction between the metallic material and the etching agent
Chemical Milling	Removal of high amount of metallic material from a piece having big dimensions by chemical reaction between the metallic material and the etching agent

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Etching	stripping, roughening, engraving, dulling, matting, wet-etching , dry-etching
Dispersed water-immiscible liquid	powder less etching (old definition), emulsion, thixotropic etching

C23F 3/00

Brightening metals by chemical means

Definition statement

This place covers:

Methods, compositions and apparatus for chemical polishing or chemical-mechanical (brightening) of metals.

Relationships with other classification places

Polishing (brightening) compositions receive an additional classification symbol in [C09G](#) (Polishing compositions other than French polish; ski waxes).

Apparatus receives an additional or only a classification symbol in [B24B](#) (Machines, devices, or processes for grinding or polishing).

Other apparatus for executing the methods mentioned above receives an additional classification symbol in [C23F](#) as far as they are specially adapted for treating metallic material (see definition field of [C23F](#)).

References

Limiting references

This place does not cover:

Abrasive or related blasting, e.g. shot blasting	B24C
Electrolytic polishing	C25F 3/16

Informative references

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

Mechanical polishing apparatus, e.g. polishing pads	B24B
Polishing compositions	C09G
Abrasives, e.g. powders, suspensions, pastes for polishing	C09K 3/00
Surface-brightening compositions in general	C09K 13/00
After treatment of conductive layers, e.g. planarisation by chemical mechanical polishing	H01L 21/3212
Polishing of the conductive pattern	H05K 3/26
Polishing for inhibiting the corrosion of the circuit, e.g. for preserving the solderability	H05K 3/282

Special rules of classification

See the rules for classification of invention /additional information, and examples mentioned for the subclass [C23F](#).

Glossary of terms

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

Chemical Polishing	Removal of metallic material from a surface in order to make the surface more bright by chemical reaction between the metallic material and the polishing agent
Chemical-Mechanical Polishing (CMP)	Removal of metallic material from a surface by combining abrasive polishing and chemical polishing, typically by applying a polishing composition or slurry to a polishing pad, establishing pressure-contact between the composition-or slurry-coated surface and the polishing pad while providing relative motion, typically rotational or orbital motion, between the surface and the polishing pad. The chemically- mechanically polishing compositions typically contains an abrasive material, such as silica, ceria, and/or alumina particles, in an acidic, neutral, or basic solution.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Chemical polishing	brightening
Chemical-mechanical polishing (CMP)	planarization, smoothing, chemical-mechanical grinding, deburring
Polishing compositions	polishing slurries
Polishing	surface improvement
Grinding	improvement of the dimensional accuracy

C23F 4/00

Processes for removing metallic material from surfaces, not provided for in group [C23F 1/00](#) or [C23F 3/00](#)

Definition statement

This place covers:

Other non-mechanical processes for removing metallic material from surfaces, e.g. by plasma or sputter etching, and compositions therefor ([C23F 4/00](#)).

Removal of metallic material from surfaces, e.g. by evaporation /volatilisation /vaporisation (EP049312, GB998708, GB817017), e.g. CO₂ or YAG lasers are utilized to thermally vaporize the metal layer, excimer laser for laser ablation, or in metal-halogen systems by laser stimulated halogen gas etching of metal substrates (US4622095, US5874011), or by using an UV light to produce a product which is either volatile or easily removed in solution (US4490211, US5318662) ([C23F 4/02](#)).

Removal of metallic material from surfaces, e.g. by physical dissolution /melting (EP0158536), by laser surface melting (EP1640109)([C23F 4/04](#)).

References

Limiting references

This place does not cover:

Cleaning by radiant energy, e.g. by UV, laser, light beam	B08B 7/0035
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Cutting, scarfing or de-surfacing by applying flames, e.g. laser flame cutting	B23K 7/00
Working metal by laser beam, e.g. welding, cutting or boring metal parts by using plasma arc cutting torch, or a laser beam cutting head	B23K 26/00
Physical treatment to alter the texture of the surface, e.g. by irradiation with laser or particle beam	C23C 16/0263
Etching semiconductors, e.g. by plasma	H01L 21/00

Informative references

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

Discharge tubes with the provision for introducing objects or materials to be exposed to the discharge, e.g. gas filled discharge tubes (plasma apparatus)	H01J 37/32
After treatment of conductive layers, e.g. by plasma etching	H01L 21/32136
Apparatus or processes for manufacturing printed circuits, e.g. by the conductive material being removed by irradiation,	H05K 3/027

Special rules of classification

The majority of documents to be classified in [C23F 4/00](#) relate to removal of metallic material by plasma, which process is more physical than chemical.

Apparatus per se for dry etching are classified in [H01J 37/00](#) and subgroups. If the apparatus has one feature specifically designed for treating metallic material, then the apparatus is also classified in [C23F 4/00](#), e.g. plasma etching method and plasma etching apparatus for processing a magnetic film composed of iron or nickel.

Glossary of terms

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

Laser- induced chemical etching	Removal or dissolution of very thin layers of metallic material from a surface (in a very small amount) by reaction between the metallic material and reactive species (in the presence of reactive gases or under clean conditions) enhanced by incidence of a laser beam, e.g. by reaction of chlorine gas with aluminium is formed aluminium chloride which desorbs resulting in an etching of aluminium surface, the etching process of aluminium is further enhanced by UV laser pulses incident to the surface.
Laser -induced ablation	Removal or dissolution of very thin layers of metallic material from a surface (in a very small amount) by evaporation or physical dissolution /dissociation under clean conditions by using an UV pulsed laser, e.g. an UV Excimer -Laser.
Laser-transmissive ablation	A very thin metal film is selectively removed by means of a single radiation pulse.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Plasma	discharge, DC, AC, RF, HF, UHF, MW, Hz, MHz, GHz, reactive ion etching, dry etching
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Laser	light (UV, IR)
Evaporation	volatilisation, vaporization
Laser -induced chemical etching	photoetching with laser as light source
Laser -induced ablation	photoablation

C23F 11/00

Inhibiting corrosion of metallic material by applying inhibitors to the surface in danger of corrosion or adding them to the corrosive agent (adding inhibitors to mineral oil, fuels, or lubricants [C10](#); adding inhibitors to pickling solutions [C23G](#))

Definition statement

This place covers:

Inhibiting corrosion of metallic material by applying inhibitors to the surface in danger of corrosion.

Inhibiting corrosion of metallic material by adding inhibitors to the corrosive agent.

Preventing leaching /elution of a metallic element /phase from an alloy, e.g. in water systems ([C23F 11/00](#)).

Preventing leaching /elution of a metallic element /phase from an alloy, e.g. in water systems ([C23F 11/08](#), [C23F 11/10](#)).

References

Limiting references

This place does not cover:

Adding corrosion inhibitors to pickling solutions	C23G
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Application corrosion inhibitors to containers, packaging elements, or packages, for contents presenting particular transport or storage problem	B65D 81/26
Adding corrosion inhibitors to deicing compositions	C09K 3/18
Adding corrosion inhibitors to antifreeze compositions	C09K 5/10 , C09K 5/20
Flameproofing agents (also used as corrosion inhibitors)	C09K 21/00
Inhibiting or prevention of corrosion during processing of hydrocarbons	C10G 7/10 , C10G 9/16 , C10G 75/02
Use of additives to fuels or fires for minimising corrosion	C10L 10/04
Adding corrosion inhibitors to lubricants	C10M , C10N 2030/12
Adding corrosion inhibitors to water systems, e.g. treating plumbing systems for preventing leaching/elution of metals in water	E03B 7/09

Informative references

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

Application corrosion inhibitors to containers, packaging elements, or packages, for contents presenting particular transport or storage problem	B65D 81/26 , B65B 55/19
Adding corrosion inhibitors to deicing compositions	C09K 3/18
Adding corrosion inhibitors to antifreeze compositions	C09K 5/10 , C09K 5/20
Compositions for in situ inhibition of corrosion in boreholes or wells	C09K 8/54
Compositions for treating boreholes or wells combined with additives added for specific purposes	C09K 8/74
Anti-oxidant compositions; Compositions inhibiting the chemical change	C09K 15/00
Flame-proofing agents (also used as corrosion inhibitors in alkaline solutions)	C09K 21/00
Inhibiting or prevention of corrosion during processing of hydrocarbons	C10G 7/10 , C10G 9/16 , C10G 75/02
Use of additives to fuels or fires for minimising corrosion	C10L 10/04
Adding corrosion inhibitors to lubricants	C10M , C10N 2030/12
Adding corrosion inhibitors to pickling solutions	C23G 1/04
In situ inhibition of corrosion in boreholes or wells	E21B 41/02
Investigating resistance of metals to corrosion	G01N 17/00

Special rules of classification

In the range [C23F 11/12](#) - [C23F 11/18](#), in the absence of an indication to the contrary, a compound is classified in the last appropriate place (last place rule).

In the head group [C23F 11/00](#), the specific technical information is relevant to the method (process) of inhibiting corrosion, e.g. the way to apply the corrosion inhibitor, and not to the corrosion inhibitor composition.

In the subgroup [C23F 11/02](#) the specific technical information is relevant to the method of adding volatile or vapour phase corrosion inhibitors (VpCI) to a enclosure, packaging ([B65D 81/26](#)), etc., for inhibiting the corrosion of a metallic material in air or a gases; VpCI corrosion inhibiting compositions per se.

In the subgroup [C23F 11/04](#) the specific technical information is relevant to the method of inhibiting corrosion of metallic material in strong acidic solutions ($\text{pH} \leq 1$), e.g. those used in acidic treatment of boreholes or wells ([C09K 8/54](#)).

In the subgroup [C23F 11/06](#) the specific technical information is relevant to the method of inhibiting corrosion of metallic material in strong alkaline solutions ($\text{pH} \geq 14$), e.g. those used in carbon dioxide capture systems.

In the subgroup [C23F 11/08](#) the specific technical information is relevant to the method of inhibiting corrosion of metallic material in acidic or alkaline solutions comprising mixture of organic and inorganic inhibitors, e.g. in water systems, cooling systems, etc.

The salts of amines classified in [C23F 11/143](#) (acid /alkaline) are also classified in [C23F 11/08](#) or [C23F 11/10](#).

In the subgroup [C23F 11/10](#) the specific technical information is relevant to the method of inhibiting corrosion of metallic material in acidic or alkaline solutions comprising mixture of organic inhibitors, e.g. e.g. in water systems, cooling systems, etc.

In the subgroup [C23F 11/18](#) the specific technical information is relevant to the method of inhibiting corrosion of metallic material in acidic or alkaline solutions comprising inorganic inhibitors.

In the subgroup [C23F 11/187](#) the specific technical information is relevant to the method of inhibiting corrosion of metallic material in acidic or alkaline solutions comprising mixture of inorganic inhibitors.

Glossary of terms

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

Applying corrosion inhibitors	Applying corrosion inhibitors to a metallic surface layer is not considered to be applying a protective coating.
Adding corrosion inhibitors	Adding corrosion inhibitors to a corrosive agent (composition) is always in a small amount, which makes a big difference between a corrosion inhibiting composition and a protective coating composition

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Iron corrosion inhibitor	deruster
Corrosion inhibitor	metal ions complexer/chelator/sequestrant

C23F 13/00

Inhibiting corrosion of metals by anodic or cathodic protection

Definition statement

This place covers:

Methods, apparatuses and electrode materials for inhibiting corrosion of metals by anodic or cathodic protection, i.e. for applying a current and polarizing a metallic object /structure to be protected while the object /structure is in use.

Relationships with other classification places

A system of particles in a paint layer classified in [C09D 5/00](#) receives an additional classification symbol in [C23F 13/06](#) as far as the combination of particles and paint constitute an assembly for cathodic protection (i.e. is acting as anode for cathodic protection of a metal).

Controlling /regulating process and device for electrochemical measuring of corrosion or corrosion - protection measurement classified in [G01N 17/02](#) receives an additional classification symbol in [C23F 13/04](#) as far as they contain a parameter of the cathodic protection process.

References

Limiting references

This place does not cover:

Anodisation	C25D 11/02
Reinforcing elements, e.g. for concrete : Anti-corrosion	E04C 5/015
Coatings or treating compositions	E04C 5/017

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Electrochemical re-alkalisation, e.g. when the same device is used to apply cathodic protection and re-alkalisation, either sequentially or simultaneously	C04B 41/4566
Electrochemical desalination, e.g. when the same device is used to apply cathodic protection and desalination, either sequentially or simultaneously	C04B 41/5376
Cathodic protection of reinforced concrete structure	C04B 2111/265
Means for protecting offshore constructions against corrosion, e.g. by cathodic protection	E02B 17/0026
Arrangements for filling cracks or cavities in building constructions, e.g. cathodic protection assemblies used as well for such arrangements	E04G 23/0203
Corrosion preventing means for features common to bolt and nuts, e.g. cathodic protection assemblies	F16B 33/008
Cathodic protection for water heaters	F24H 9/0047
Electrochemical measuring systems for weathering, corrosion or corrosion protection measurements, e.g. cathodic protection measurements	G01N 17/02

Informative references

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

Component parts, detail or accessories for large containers	B65D 90/00
Compositions of mortars, concrete, artificial stone, containing inorganic binders	C04B 28/00
Anti-corrosive paints	C09D 5/08
Anti-corrosive paints containing metal dust	C09D 5/10
Anti-corrosive paints containing Al dust	C09D 5/103
Anti-corrosive paints containing Zn dust	C09D 5/106
Electrically conductive paints	C09D 5/24
Arrangements or adaptation of tanks for water supply	E03B 11/00
Reinforced concrete	E04B 1/20
Component parts of turbines for preventing corrosion	F01D 25/007
Investigating or analysing concrete or cement by specific methods	G01N 33/383
Intrinsically conductive polymers	H01B 1/124

Special rules of classification

An ionic conductor as such (e.g. composition) is classified in [C23F 13/02](#) since the ionic conductor constitutes a selection of ionic conductivity condition.

The integration of an ionic conductor in a cathodic protection system is classified in [C23F 13/06](#) since the specific technical information relevant is the combination of the ionic conductor with other elements of the cathodic protection device.

In both cases, the KW cp ionic ([C23F](#)) has to be given to the document.

A system of particles in a paint layer ([C09D 5/00](#)) acting as anode for cathodic protection of a metal is classified in [C23F 13/06](#) since the combination of particles and paint constitute an assembly for cathodic protection.

An electrode made of a layer directly deposited on the metal to be protected is classified in [C23F 13/08](#).

Monitoring arrangements for electrodes, e.g. wear indicators, alarms, are classified in [C23F 13/22](#).

[C23F 2201/00](#) covers cathodic protection assemblies and processes in which specific material is protected by cathodic protection, i.e. when the assembly or process is specifically designed to protect a given material.

[C23F 2201/02](#) covers any aspects of cathodic protection assemblies and processes which are specially adapted to protect reinforcement in concrete.

Glossary of terms

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

Anodic protection (AP)	Technique to control the corrosion of a metal surface by making it the anode of an electrochemical cell and controlling the electrode potential in a zone where the metal is passive.
Cathodic protection (CP)	Technique to control the corrosion of a metal surface by making it the cathode of an electrochemical cell
Sacrificial anode	A piece of corrodible metal, attached to a metallic surface to be protected, that is preferentially consumed by electrolytic action.
Stray currents	Stray currents may originate from direct-current distribution lines, substations, or street railway systems, etc., and flow into a pipe system or other steel structure.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Ionic conductor	backfill, grout, hydratant, humectant, electrochemical activating agent
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In patent documents, the following words/expressions are often used as synonyms:

- "sacrificial anode", "galvanic anode" and "active anode"

C23F 14/00

Inhibiting incrustation in apparatus for heating liquids for physical or chemical purposes (adding scale preventives or removers to water [C02F 5/00](#) {; inhibiting incrustation in polymerisation reactors [C23F 15/005](#)})

Definition statement

This place covers:

Inhibiting incrustation in apparatus for heating liquids for physical or chemical purposes, e.g. evaporators, distillations units, crystallisation units, etc. ([C23F 14/00](#)).

Inhibiting incrustation by chemical means and incrustation inhibitors per se ([C23F 14/02](#)).

Other apparatus for executing the methods mentioned above as far as they are specially adapted for treating metallic material ([C23F 14/00](#)).

References

Limiting references

This place does not cover:

Methods for preventing fouling	B08B 17/00
Adding scale preventives or removers to water	C02F 5/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Preventing formation of scale in cooking vessels	A47J 36/42
Treatment of water, waste water or sewage	C02F 1/00
Preventing incrustations during destructive distillation of carbonaceous materials	C10B 43/14
Inhibiting or prevention of corrosion or incrustation during processing of hydrocarbons	C10G 7/10 , C10G 9/16 , C10G 75/02
Preventing incrustation in pipes	F16L 58/00

Informative references

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

Anodic or cathodic protection	C23F 13/00
Evaporating	B01D 1/00
Distillation	B01D 3/00
Crystallisation	B01D 9/00
Treatment of water, waste water or sewage	C02F 1/00
Composition for preventing, limiting or eliminating depositions	C09K 8/52
Composition for preventing, limiting or eliminating inorganic depositions, e.g. sulfates or carbonates	C09K 8/528
Preventing the formation of deposits or corrosion, e.g. by using filters	F28F 19/00

Special rules of classification

In the head group [C23F 14/00](#), the specific technical information is relevant to the method (process) of inhibiting incrustations in apparatuses for heating liquids for physical or chemical purposes

In the subgroup [C23F 14/02](#) the specific technical information is relevant to the method for preventing or removing scale formation in systems in which a fluid circulation, preferably a water-based fluid circulation takes place, by adding chemical incrustation inhibitors to the system; Incrustation inhibiting compositions per se.

The expression "inhibiting incrustation in general" is used with the meaning:

"inhibiting incrustation of metallic material " and covers: a particular purpose (application), that of inhibiting incrustation of metallic material, and not inhibiting incrustation general;

and this for two reasons:

first of all incrustation "process for forming a tenacious crust" is mainly a property of the environment where an object is placed and hardly a property of the material from which the object is made; inhibiting incrustation in general should thus be better classified in the process where the problem occurs (e.g. [C02F](#)).

secondly to make the difference with fouling "accumulation of particulates of microorganisms on the surface" classified in [B08B 17/00](#). Moreover, the term fouling is very broad and appears to cover also processes as "rusting" ([C23F 11/00](#)) and "formation of scale" ([C02F](#)).

Glossary of terms

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

Incrustation of metallic material	Accumulation of deposition /precipitation of undesired solid / dense products on a metallic surface in systems in which a fluid circulation takes place, preferably a water-based fluid circulation takes place, e.g. deposition /precipitation of compounds of calcium, magnesium, barium or strontium (carbonates/ sulphates), iron, lead, zinc sulphide, zinc, cadmium carbonates (white rust).
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Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Incrustation	encrustation, crust, carbonate/sulphate scale, lime scale, sulphide scale, aluminosilicate scale, oxalate scale., white rust.
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In patent documents, the following words/expressions are often used with the meaning indicated:

"inhibiting incrustation in general"	"inhibiting incrustation of metallic material "
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C23F 15/00

Other methods of preventing corrosion or incrustation

Definition statement

This place covers:

Other methods of preventing corrosion or incrustation, e.g. by removing the corrosive agent from the medium or rendering it non corrosive by neutralizing it ([C23F 15/00](#)).

Inhibition incrustations, e.g. in polymerization reactors (EP1501910), in waste liquid line of an autoanalyzer (EP1477811) ([C23F 15/005](#)).

Other apparatus for executing the methods mentioned above as far as they are specially adapted for treating metallic material ([C23F 15/00](#)).

References

Limiting references

This place does not cover:

Methods for preventing fouling	B08B 17/00
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Informative references

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

Inhibiting corrosion of metals by anodic or cathodic protection	C23F 13/00
Evaporating	B01D 1/00
Distillation	B01D 3/00
Crysatllization	B01D 9/00
Processes of separation, e.g. by filtration, ultrafiltration, dialysis, osmosis	B01D 61/00
Chemical, physical, or physico-chemical processes carried out with a view to control or to change the pH- value; Application of buffer salts; Neutralisation reactions	B01J 19/0086
Mechanical methods for preventing fouling in hull protection	B63B 59/04
Treatment of water, waste water, or sewage by degassing (liberation of dissolved gases)	C02F 1/20
Treatment of water, waste water, or sewage by electrochemical methods for prevention or elimination of deposits	C02F 1/4602
Treatment of water, waste water, or sewage with magnetic or electric field for prevention or elimination of deposits	C02F 1/48
Treatment of water, waste water, or sewage by addition of specified substances, e.g. by addition of complex-forming compounds	C02F 1/68 , C02F 1/683
Treatment of water, waste water, or sewage by oxidation	C02F 1/72
Preventing scale by precipitation of the hardness	C02F 5/02
Compositions for preventing, limiting or eliminating depositions	C09K 8/52
Anti-oxidant compositions; Compositions inhibiting the chemical change	C09K 15/00
Preventing or removing incrustations in thermal non-catalytic cracking	C10G 9/16
Inhibiting corrosion or fouling in apparatus for treatment or conversion of hydrocarbon oils	C10G 75/00
Use of additives to fuels or fires for minimising corrosion or incrustation	C10L 10/04
Means for protecting offshore constructions against corrosion	E02B 17/0026
Devices and methods for diminishing corrosion in steam boilers	F22B 37/025
Preventing the formation of deposits or corrosion in heta-exchangers , e.g. by protective currents	F28F 19/004

Special rules of classification

A clear difference has to be made between the word "fouling" with the above meanings and the word "fouling" used with the meaning "accumulation of particulates of microorganisms of the surface" classified in [B08B 17/00](#).

A clear difference has to be made between the word "scale" with the above meaning and the word "scale" used with the meaning "white rust" "staining", "incrustation" "carbonate, sulphate, sulphide, silicate, oxalate scale" or "hydrocarbon scale" classified in [C23F 14/00](#), [C23F 15/00](#).

Synonyms and Keywords

In patent documents, the following words/expressions are often used with the meaning indicated:

"fouling"	"incrustation" or "rusting".
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"scale"	"rust" or " scale from ferrous metals, copper or aluminium alloys" or "rust staining".
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C23F 17/00

Multi-step processes for surface treatment of metallic material involving at least one process provided for in class [C23](#) and at least one process covered by subclass [C21D](#) or [C22F](#) or class [C25](#) (coating for obtaining at least two superposed coatings either by methods not provided for in a single one of main groups [C23C 2/00](#) - [C23C 26/00](#), or by combinations of methods provided for in subclasses [C23C](#) and [C25D](#), [C23C 28/00](#))

Definition statement

This place covers:

Multi-step processes for surface treatment of metallic material involving at least one process provided for in class [C23](#) and at least one process covered by subclass [C21D](#) or [C22F](#) or class [C25](#).

References

Limiting references

This place does not cover:

Coating for obtaining at least two superposed coatings either by methods not provided for in a single one of main groups C23C 2/00 - C23C 26/00 , or by combinations of methods provided for in subclasses C23C and C25D	C23C 28/00
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Informative references

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

Modifying the physical structure of ferrous metals; General devices for heat treatment of ferrous or non-ferrous metals or alloys; making metals malleable by decarburisation, tempering or other treatment	C21D
Changing the physical structure of non-ferrous metals or alloys by heat treatment or by hot or cold working	C22F
After-treatment of hot-dipped or immersed coated metal surfaces	C23C 2/26
After-treatment of sprayed coated metal surfaces	C23C 4/18
Chemical surface treatment of metallic material by reaction of the surface with a reactive gas, e.g. diffusion coatings	C23C 8/00
After-treatment of vacuum evaporated coated metal surfaces	C23C 14/58
After-treatment of chemical vapour deposited coated metal surfaces	C23C 16/56
After-treatment of electroplated surfaces	C25D 5/48

Special rules of classification

The majority of documents classified in [C23F 17/00](#) are also classified with at least one of the above mentioned subclasses /groups. In many cases the classification of invention information is only classified in the most appropriate place, namely, in only one of these subclasses /groups, with no need to also classify in [C23F 17/00](#). This practice is very desirable, although not compulsory. As far

as the combination of process steps defined as in the title of [C23F 17/00](#) is important (invention-like information), these documents belong also in this class.