

## C25B

### ELECTROLYTIC OR ELECTROPHORETIC PROCESSES FOR THE PRODUCTION OF COMPOUNDS OR NON-METALS; APPARATUS THEREFOR (anodic or cathodic protection [C23F 13/00](#); single-crystal growth [C30B](#))

#### Definition statement

*This place covers:*

Electrolytic or electrophoretic processes for the production of inorganic compounds, non-metals or organic compounds.

Cells or assemblies of cells and their constructions.

Electrodes, diaphragms.

Operating or servicing of cells.

#### Relationships with other classification places

Reversible fuel cells that act as electrolyzers are classified in [H01M 8/18](#).

Multi-step processes for surface treatment of metallic material involving at least one process provided for in class [C23](#) and at least one process provided for in class [C25](#) are classified in group [C23F 17/00](#).

Compounds of particular interest are also classified in the relevant classes, [C01](#) (inorganic chemistry), [C07](#) (organic chemistry) and [C08](#) (organic macromolecular compounds). The electrolytic or electrophoretic purification of materials is classified according to the nature of the liquid in the relevant places, e.g. [A01K 63/00](#), [C02F 1/46](#), [C25B 15/08](#), [C25D 21/16](#), [C25F 7/02](#).

Cold fusion methods as such are classified in [G21B 3/00](#), but electrodes and cells for cold fusion are further classified in [C25B](#).

An electrothermal treatment of ores or metallurgical products for obtaining metals or alloys is classified in [C22B 4/00](#) and does not involve an electrolytic process.

Alloys as such, prepared by electrolytic methods are classified in [C22C](#).

#### References

##### Limiting references

*This place does not cover:*

Treatment of water, waste water, or sewage by electrochemical means, e.g. electrolysis electrodes therefor	<a href="#">C02F 1/46</a>
Separation or purification of peptides, e.g. of proteins, by electrophoresis	<a href="#">C07K 1/26</a>
Inhibiting corrosion of metals by anodic or cathodic protection	<a href="#">C23F 13/00</a>
Single crystal growth	<a href="#">C30B</a>

##### Informative references

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

General disinfection or sterilisation of materials or objects by electrolysis	<a href="#">A61L 2/035</a>
Making harmful compounds harmless by subjecting to electrochemical processes, electrodialysis	<a href="#">A62D 3/11</a>

Gas separation, using electrochemical methods	<a href="#">B01D 53/326</a>
Separation, other than separation of solids, by electrophoresis	<a href="#">B01D 57/02</a>
Electrodialysis, electroosmosis	<a href="#">B01D 61/42</a>
Catalysts	<a href="#">B01J</a>
Processes employing the direct application of electric energy (i.e. electrochemical processes); Apparatus therefor	<a href="#">B01J 19/08</a>
Separation of hydrogen or hydrogen containing gases from gaseous mixtures	<a href="#">C01B 3/50</a>
Carbon masses	<a href="#">C01B 32/00</a> , <a href="#">C04B 35/52</a>
Electrochemical sensors	<a href="#">G01N 27/26</a>
Low temperature nuclear reactors, e.g. cold fusion	<a href="#">G21B 3/00</a>
Electrochemical processes or apparatus for generating energy	<a href="#">H01M</a>
Electrodes for fuel cells	<a href="#">H01M 4/86</a>
Membranes and other details of fuel cells	<a href="#">H01M 8/02</a> , <a href="#">H01M 8/10</a>
Semiconducting devices, photovoltaic cells as conversion devices, sources of energy (in particular for water electrolysis)	<a href="#">H02S 40/44</a>
Means to utilise heat energy, e.g. hybrid systems producing warm water and electricity at the same time	<a href="#">H02S 40/44</a>

## Special rules of classification

[C25B](#) concerns the production of compounds or non-metals, which includes separating the said products as such, or at least the possibility of separating them.

Illustrative examples:

- (1) Electrolysis of sodium chloride to develop chlorine gas that is collected as a product is covered by [C25B](#).
- (2) Electrolysis of water comprising sodium chloride to form chlorine / hypochlorite in solution for disinfection is not covered by [C25B](#).

As a consequence, the electrolytic cells and parts of cells in example (1) are covered by [C25B](#) as well, while the electrolytic cells and parts of cells in example (2) are not.

There are, of course, cases that are covered by [C25B](#) and another subclass or subgroup.

## Glossary of terms

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

Monopolar electrode	A monopolar electrode is connected to a power source and thus acts either as an anode or as a cathode.
Bipolar electrode	A bipolar electrode is a floating conductor in contact with an ionically conductive phase. It is a field electrode, positioned in an electrical field between a monopolar anode and a monopolar cathode without being itself connected to a power source. Through the action of the electrical field, the side of the bipolar electrode that faces the cathode acts as an anode, and the side that faces the anode acts as a cathode.
Dimensionally-stable electrode	An electrode that is not intended to dissolve upon electrolysis (not a sacrificial electrode).

## Synonyms and Keywords

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

BPE	Bipolar electrode
MEA	Membrane Electrode Assembly
DSE	Dimensionally Stable Electrode
DSA	Dimensionally Stable Anode
GDE	Gas Diffusion Electrode

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

- "diaphragm" and "separator" or "membrane"

## C25B 1/00

### Electrolytic production of inorganic compounds or non-metals

#### Definition statement

*This place covers:*

Electrolytic production of all those inorganic compounds or non-metals that do not fall within the scope of one of the subgroups of [C25B 1/00](#).

Specific compounds like hydrogen, oxygen, silicon, ozone, alkali metal compounds, inorganic acid, per-compounds, etc. are classified in the subgroups of [C25B 1/00](#), not in [C25B 1/00](#).

## C25B 1/02

### Hydrogen or oxygen

#### Definition statement

*This place covers:*

Electrolytic production of hydrogen or oxygen.

## References

### Informative references

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

Separation of hydrogen or hydrogen containing gases from gaseous mixtures, e.g. hydrogen electrochemical pumps	<a href="#">C01B 3/50</a>
Engines or plants characterised by use of other specific gases, e.g. oxyhydrogen (even when produced by an electrolytic cell)	<a href="#">F02B 43/10</a>
Engine-pertinent apparatus for supplying combustion engine with gas, e.g. hydrogen or oxygen, the apparatus having means for preparing such gas (even when the means is an electrolytic cell)	<a href="#">F02M 25/12</a>

## Special rules of classification

Only the details of the electrolytic production process present in the document are classified.

A simple reference to the presence of an electrolytic cell or hydrogen produced by electrolysis does not justify classification in [C25B](#).

**C25B 1/04****by electrolysis of water****Definition statement**

*This place covers:*

Electrolysis of water with production of hydrogen and oxygen from water at the anode and cathode, even when this water comprises an electroconductive additive, such as a hydroxide or an acid.

Steam electrolysis is also covered.

**C25B 1/13****Ozone****Relationships with other classification places**

Production of dissolved species for treating of water or waste water by electrochemical methods, cells and electrodes therefor is classified in [C02F 1/467](#).

**References****Informative references**

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

Disinfecting / sterilising with "dental water"	<a href="#">A61C 1/0076</a>
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**C25B 1/24****Halogens or compounds thereof****Relationships with other classification places**

Production of dissolved species for treating of water or waste water by electrochemical methods, cells and electrodes therefor is classified in [C02F 1/467](#).

**C25B 1/28****Per-compounds****Definition statement**

*This place covers:*

Electrolytic production of per-compounds (see Glossary of terms).

**Relationships with other classification places**

Treatment of water and waste water by electrochemical disinfection is classified in [C02F 1/4672](#).

**References****Informative references**

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

Disinfecting / sterilising with "dental water"	<a href="#">A61C 1/0076</a>
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## Glossary of terms

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

per-compounds	When an element can bond with oxygen in multiple ways to form different polyatomic ions (also called oxyanions), the prefixes "hypo-" and "per-" are used in conjunction with the suffixes "-ite" and "-ate" and a portion (x) of the name of the primary element to designate the oxyanion: (1) a "hypo-x-ite" ion has one fewer oxygen atom than (2) an "x-ite" ion, while an "x-ite" ion has one fewer oxygen atom than (3) an "x-ate" ion, and an "x-ate" ion has one fewer oxygen atom than (4) a "per-x-ate" ion (per-compound). For example, $\text{ClO}^-$ is hypochlorite, $\text{ClO}_2^-$ is chlorite, $\text{ClO}_3^-$ is chlorate, and $\text{ClO}_4^-$ is perchlorate.
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## C25B 1/55

### Photoelectrolysis

#### Definition statement

*This place covers:*

Photoelectrolysis process only.

#### Relationships with other classification places

Distinctions should be drawn among a (1) photoelectrolytic process ([C25B 1/55](#)), (2) cell with two electrodes, even without externally applied voltage ([C25B 9/50](#)), and (3) photolytic process or cell with a single electrode where the process is catalyzed by a substance producing photoelectrons ([B01J 19/12](#) - [B01J 19/129](#)).

#### References

##### Informative references

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

Catalysts characterised by their photocatalytic properties	<a href="#">B01J 35/39</a>
Light-sensitive devices, e.g. panels or arrays of photoelectrochemical cells	<a href="#">H01G 9/20</a>
Photoelectrochemical cells	<a href="#">H01M 14/005</a>

## C25B 3/00

### Electrolytic production of organic compounds

#### Definition statement

*This place covers:*

Production of organic compounds by an electrolytic reaction.

#### References

##### Informative references

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

Electrolytic polymerisation	<a href="#">C08G 61/00</a>
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Production of hydrocarbons from hydrogen (even when produced by an electrolytic cell) and carbon monoxide	<a href="#">C10G 2/30</a>
Production of hydrocarbons from hydrogen (even when produced by an electrolytic cell) and carbon dioxide	<a href="#">C10G 2/50</a>
Electrocoating a substrate with an organic material	<a href="#">C25D 9/02</a>
Engines or plants characterised by use of other specific gases, e.g. oxyhydrogen (even when produced by an electrolytic cell)	<a href="#">F02B 43/10</a>
Engine-pertinent apparatus for supplying combustion engine with gas, e.g. hydrocarbon gas, the apparatus having means for preparing such gas (even when the means is an electrolytic cell)	<a href="#">F02M 25/12</a>

## Glossary of terms

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

Oxidation and reduction	A reaction that takes place directly at the organic molecule and involves an electron being lost (oxidation) or gained (reduction).
Coupling	A reaction that takes place directly at the organic molecule and does not involve oxidation or reduction, e.g. a Kolbe reaction.

## C25B 5/00

**Electrogenerative processes, i.e. processes for producing compounds in which electricity is generated simultaneously**

### Definition statement

*This place covers:*

Processes that generate electricity and produce a compound other than water, e.g. hydrogen peroxide.

## C25B 7/00

**Electrophoretic production of compounds or non-metals (separation or purification of peptides, e.g. of proteins, by electrophoresis [C07K 1/26](#))**

### Definition statement

*This place covers:*

Production of compounds or non-metals where the process includes a step of reduction or oxidation of the material from which the compound or non-metals is formed, e.g. formation of a polymer.

## References

### Limiting references

*This place does not cover:*

Separation or purification of peptides, e.g. of proteins, by electrophoresis	<a href="#">C07K 1/26</a>
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**Informative references**

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

Electrocoating, when the coating is only deposited and not produced by an electrolytic reaction	<a href="#">C25D 13/04</a>
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**C25B 9/00**

**Cells or assemblies of cells; Constructional parts of cells; Assemblies of constructional parts, e.g. electrode-diaphragm assemblies; Process-related cell features**

**Definition statement**

*This place covers:*

Cells, assembly of cells or assemblies of constructional parts used for the electrolytic production processes that are defined in other subgroups of [C25B](#).

**Relationships with other classification places**

Devices for the electrolytic treatment of water or sewage are classified in [C02F 1/46104](#).

**References****Informative references**

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

Electrolytic cells for electroplating	<a href="#">C25D 17/00</a>
The combination of an electrolytic cell with a combustor to improve combustion	<a href="#">F02B 43/10</a>
Reversible fuel cells	<a href="#">H01M 8/18</a>

**Glossary of terms**

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

Grouping of such cells into batteries	Arranging plural cells such that they form a pile (not to form a storage battery).
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**C25B 9/05****Pressure cells****Definition statement**

*This place covers:*

Cells subjected to pressure that exceeds ambient pressure, e.g. high-pressure water electrolysis system.

**C25B 9/17**

**Cells comprising dimensionally-stable non-movable electrodes; Assemblies of constructional parts thereof**

**Definition statement**

*This place covers:*

Cells and their construction comprising electrodes that are not sacrificial.

**Glossary of terms**

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

Dimensionally-stable electrode	An electrode that is not intended to dissolve upon electrolysis (not a sacrificial electrode).
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**Synonyms and Keywords**

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

DSE	Dimensionally Stable Electrode
DSA	Dimensionally Stable Anode

**C25B 9/23**

**comprising ion-exchange membranes in or on which electrode material is embedded**

**Definition statement**

*This place covers:*

Membrane-electrode assemblies (MEA).

**C25B 9/30**

**Cells comprising movable electrodes, e.g. rotary electrodes; Assemblies of constructional parts thereof**

**Definition statement**

*This place covers:*

Electrodes that move in space or around an axis, such as rotary electrodes.

**C25B 9/40**

**Cells or assemblies of cells comprising electrodes made of particles; Assemblies of constructional parts thereof**

**Definition statement**

*This place covers:*

Electrodes that comprise a bed of electrically conductive particles that are arranged such that they at least temporarily contact each other and an electrical conductor (a net, a plate etc.) that provides connection to a power source.



## Relationships with other classification places

Electrodes in particulate form for treatment of water, waste water or sewage are classified in [C02F 1/46114](#).

## C25B 9/43

{comprising fluidised bed electrodes}

### Definition statement

*This place covers:*

Electrodes that comprise a bed of electrically conductive particles that are arranged such that they are in motion and temporarily contact each other and an electrical conductor (a net, a plate etc.) that provides connection to a power source.

## C25B 9/47

{comprising static bed electrodes}

### Definition statement

*This place covers:*

Electrodes that comprise a bed of electrically conductive particles that are arranged such that they are at rest and continuously touch each other and an electrical conductor (a net, a plate etc.) that provides connection to a power source.

### Synonyms and Keywords

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

- " fixed bed electrode " and " static bed electrode "

## C25B 9/65

**Means for supplying current; Electrode connections; Electric inter-cell connections**

### Definition statement

*This place covers:*

Devices and connections that are monopolar.

### References

#### Informative references

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

Bipolar electrodes	<a href="#">C25B 9/75</a>
Electrical connections in fuel cells or storage batteries	<a href="#">H01M 8/02</a> , <a href="#">H01M 50/50</a>
Electrical connections in general	<a href="#">H01R</a>

**C25B 9/73****of the filter-press type****Glossary of terms**

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

Filter-press type cells	Filter-press type cells generally consist of a stack of vertical frames that define electrolysis chambers in which electrodes are arranged vertically.
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**C25B 9/75****having bipolar electrodes****Definition statement**

*This place covers:*

Stacks of a plurality of cells with bipolar electrodes, as in a filter press.

**Glossary of terms**

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

Monopolar electrode	A monopolar electrode is connected to a power source and thus acts either as an anode or as a cathode.
Bipolar electrode	A bipolar electrode is a floating conductor in contact with an ionically conductive phase. It is a field electrode, positioned in an electrical field between a monopolar anode and a monopolar cathode without being itself connected to a power source. Through the action of the electrical field, the side of the bipolar electrode that faces the cathode acts as an anode, and the side that faces the anode acts as a cathode.

**Synonyms and Keywords**

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

BPE	Bipolar electrode
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**C25B 9/77****having diaphragms****Definition statement**

*This place covers:*

Cells with a diaphragm, e.g. membrane or separator, which is a permeable barrier between electrodes.

**C25B 11/00****Electrodes; Manufacture thereof not otherwise provided for****Definition statement**

*This place covers:*

Electrodes used for the electrolytic or electrochemical production processes that are defined somewhere in [C25B](#).

**Relationships with other classification places**

Electrodes for treatment of water or sewage are classified in [C02F 1/46109](#).

**References****Informative references**

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

Catalysts characterised by their photocatalytic properties	<a href="#">B01J 35/39</a>
Electrodes for electrowinning	<a href="#">C25C 7/02</a>
Electrodes for electroplating	<a href="#">C25D 17/10</a>
Electrodes for storage batteries	<a href="#">H01M 4/00</a>
Electrodes for fuel cells	<a href="#">H01M 4/86</a>

**C25B 11/02****characterised by shape or form****Definition statement**

*This place covers:*

Special forms of electrodes, such as Venetian blinds, expandable electrodes.

**C25B 11/03****perforated or foraminous****Definition statement**

*This place covers:*

Perforated or foraminous structures, e.g. expandable metal.

**C25B 11/032****Gas diffusion electrodes****References****Informative references**

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

Gas diffusion electrodes for the generation of power	<a href="#">H01M 4/86</a> , <a href="#">H01M 8/02</a>
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## Synonyms and Keywords

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

GDE	Gas diffusion electrodes
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## C25B 11/043

### Carbon, e.g. diamond or graphene

#### Definition statement

*This place covers:*

Electrodes that have a carbon-based structure, e.g. carbon cloth.

#### Relationships with other classification places

Diamond electrodes used in treatment of water or waste water etc. are classified in [C02F 1/46109](#) and [C02F 2001/46133](#).

#### References

##### Informative references

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

Electrodes that comprise carbon either as the substrate or a coating	<a href="#">C25B 11/065</a>
Diamond electrodes that comprise a diamond coating on a substrate	<a href="#">C25B 11/083</a>
Carbon masses	<a href="#">C04B 35/52</a>

## C25B 11/051

### Electrodes formed of electrocatalysts on a substrate or carrier

#### Glossary of terms

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

Substrate	The substrate forms the bulk of the electrode and includes oxide layers, which are particularly common on valve metals.
Coating	The coating includes all layers on the substrate, i.e. the coating is not exclusively the electrocatalytic layer, which is usually on top and in contact with the electrolyte. The coating also includes intermediate layers, such as oxide layers that are not inevitable, but intentionally formed on the substrate.

## C25B 13/00

### Diaphragms; Spacing elements

#### Definition statement

*This place covers:*

Structural material used to separate the electrodes of an electrolytic or electrophoretic cell to form two or more compartments and allow the flow of an electrolytic solution or the migration of particular ions while preventing the intermixing of the products formed at the surface of the electrodes.

## References

### Informative references

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

Membranes for separation processes	<a href="#">B01D 67/00- B01D 71/00</a>
Membranes for electrolytic production, recovery or refining of metals or alloys	<a href="#">C25C 7/04</a>
Membranes for fuel cells	<a href="#">H01M 8/0289</a>

## C25B 13/04

characterised by the material

## References

### Informative references

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

Solid state electrolytes for fuel cells, characterised by the electrolyte material	<a href="#">H01M 8/1016</a> , <a href="#">H01M 2300/0088</a> , <a href="#">H01M 2300/0065</a>
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## C25B 13/08

based on organic materials

### Relationships with other classification places

Organic polymer membranes, when the emphasis is on the polymer electrolyte compound, are classified in [C08J 5/22](#) and in [H01M 8/1018](#) or [H01M 2300/0082](#) if the polymer electrolyte compound is used in fuel cells.

## C25B 15/00

Operating or servicing cells

### Definition statement

*This place covers:*

Operating or servicing of cells when generally applied to a cell or in a process of [C25B](#).

When related to a specific process only, the operating or servicing is classified with the process, e.g. decomposition of amalgam, which is process-related and therefore classified in [C25B 1/42](#).

## C25B 15/02

Process control or regulation

## References

### Informative references

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

Controlling or regulating in general	<a href="#">G05</a>
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## **C25B 15/04**

### **Regulation of the inter-electrode distance**

#### **Relationships with other classification places**

Regulation of the inter-electrode distance in electrochemical machining, electrolytic grinding and electro-erosion is classified in [B23H](#).