

## C25B

### ELECTROLYTIC OR ELECTROPHORETIC PROCESSES FOR THE PRODUCTION OF COMPOUNDS OR NON-METALS; APPARATUS THEREFOR

#### Definition statement

*This subclass/group covers:*

Electrolytic production of inorganic compounds, of non-metals and of organic compounds

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

Electrophoretic production of compounds or non-metals

Cells or assemblies of cells, constructional parts of cells, assemblies of constructional parts, e.g. electrode-diaphragm assemblies, as long as they are used in or suitable for one of the above production methods

Electrodes, manufacture thereof not otherwise provided for, as long as they are used in or suitable for one of the above production methods

Diaphragms, spacing elements, as long as they are used in or suitable for one of the above production methods

Operating or servicing of cells, as long as this operating or servicing is part of one of the above production methods

#### Relationship between large subject matter areas

The compounds of particular interest are also classified in the relevant classes, C01 (inorganic chemistry), C07 (organic chemistry), [C07F](#) (organo-metallic compounds), and C08 (polymer chemistry).

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](#).

Reversible fuel cells which act as electrolyzer, are classified in [H01M 8/18](#).

Production of dissolved species for purposes of water or waste water treatment is classified in [C02F 1/46](#) and subgroups.

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 method as such is classified in [G21B 3/00](#) but electrodes and cells for the 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 relevant to classification in this subclass

*This subclass/group does not cover:*

Treating of water, waste water etc. by electrochemical methods, cells and 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:*

Methods or apparatus for disinfecting or sterilising	<a href="#">A61L 2/03</a> <a href="#">A61L 2/035</a>
Making harmful compounds harmless by subjecting to electrochemical processes, electro dialysis	<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 61/42</a>
Electrodialysis, electroosmosis	<a href="#">B01D 13/02</a> <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 31/00</a> , <a href="#">C04B 35/52</a>
Semiconducting devices, photovoltaic cells as conversion devices, sources of energy (in particular for water electrolysis)	<a href="#">H01L 31/058</a>
Electrochemical processes or apparatus for generating energy	<a href="#">H01M</a>
Electrochemical sensors	<a href="#">G01N 27/00</a>
Cold fusion, the method as such (however, cells and electrodes are classified in <a href="#">C25B</a> )	<a href="#">G21B 3/00</a>

### Special rules of classification within this subclass

Classification in [C25B](#) is always according to the last place priority rule.

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

Illustrative example:

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

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

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

### Glossary of terms

*In this subclass/group, the following terms (or expressions) are used with the meaning indicated:*

Monopolar electrode	Electrode which is connected to a power source and thus acts either as an anode or as a cathode
Bipolar electrode	Field electrode, i.e. an electrode which is positioned in the 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 which faces the cathode acts as an anode and the other side which faces the anode acts as a cathode

### Synonyms and Keywords

In patent documents the following abbreviations are often used:

Diaphragm	Membrane
MEA	Membrane Electrode Assembly
DSE	Dimensionally Stable Electrode
DSA	Dimensionally Stable Anode
GDE	Gas Diffusion Electrode

## C25B 1/00

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

#### Definition statement

*This subclass/group covers:*

Electrolytic production of inorganic compounds or non metals not covered in [C25B 1/003](#)- [C25B 1/46](#), e.g. electrolytic preparation of ammonia.

## C25B 1/003

[N: by photo-electrolysis with or without external current

**source]**

### **Definition statement**

*This subclass/group covers:*  
Photo-electrolysis process only.

### **References relevant to classification in this group**

*This subclass/group does not cover:*

Photocatalysts	<a href="#">B01J 35/004</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>

### **Special rules of classification within this group**

Distinction is to be done between a photoelectrolytic process or cell with two electrodes (even without externally applied voltage), and a photolytic process or cell with a single electrode where the process is catalyzed by a substance producing photoelectrons.

## **C25B 1/02**

### **of hydrogen or oxygen**

### **Definition statement**

*This subclass/group covers:*  
Electrolytic production of hydrogen or oxygen.

### **References relevant to classification in this group**

*This subclass/group does not cover:*

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>
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### Special rules of classification within this group

Only 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 subclass/group 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 1/10

#### in diaphragm cells

#### Definition statement

*This subclass/group covers:*

Electrolytic production of hydrogen or oxygen by electrolysis of water using diaphragm cells, e.g. membrane, separator between the electrodes.

#### Informative references

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

Reversible fuel cells	<a href="#">H01M 8/18</a>
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## C25B 1/12

### in pressure cells

#### Definition statement

*This subclass/group covers:*

Electrolytic production of hydrogen or oxygen by electrolysis of water using pressure cells, e.g. high pressure water electrolysis system

#### Informative references

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

Reversible fuel cells	<a href="#">H01M 8/18</a>
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## C25B 1/13

### of ozone

#### References relevant to classification in this group

*This subclass/group does not cover:*

Disinfecting / sterilising using electric current or electrolysis	<a href="#">A02L /03A02L/03E</a>
Disinfecting / sterilising with "dental water"	<a href="#">A61C 1/0076</a>
Production of dissolved species for treating of water, waste water etc. by electrochemical methods, cells and electrodes therefor	<a href="#">C02F 1/467</a>

## C25B 1/24

### of halogens or compounds thereof

#### References relevant to classification in this group

*This subclass/group does not cover:*

Production of dissolved species for treating of water, waste water etc. by electrochemical methods, cells and electrodes therefor	<a href="#">C02F 1/467</a>
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## C25B 1/28

### of per-compounds

#### Definition statement

*This subclass/group covers:*

Electrolytic production of per-compounds which are not covered by [C25B 1/285](#), [C25B 1/30](#), [C25B 1/32](#)

#### References relevant to classification in this group

*This subclass/group does not cover:*

Disinfecting / sterilising using electric current or electrolysis	<a href="#">A02L /03A02L/03E</a>
Disinfecting / sterilising with "dental water"	<a href="#">A61C 1/0076</a>
Treatment of water and waste water by electrochemical disinfection	<a href="#">C02F 1/4672</a>

## C25B 3/00

### Electrolytic production of organic compounds

#### Definition statement

*This subclass/group covers:*

Production of organic compounds by an electrolytic reaction.

#### References relevant to classification in this group

*This subclass/group does not cover:*

Electrolytic polymerization	<a href="#">C08G 61/00</a>
Electrocoating a substrate with an organic material	<a href="#">C25D 9/02</a>
Production of hydrocarbons from hydrogen (even when produced by an electrolytic cell) and carbon monoxide	<a href="#">C10G 2/00B</a>



Production of hydrocarbons from hydrogen (even when produced by an electrolytic cell) and carbon dioxide	<a href="#">C10G 2/00F</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 subclass/group, the following terms (or expressions) are used with the meaning indicated:*

Oxidation and reduction	oxidation or reduction directly at the organic molecule
Coupling	reaction without oxidation or reduction directly at the organic molecule, e.g. a Kolbe reaction

### C25B 5/00

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

### C25B 7/00

**Electrophoretic production of compounds or non-metals (separation or purification of peptides, e.g. of proteins, by electrophoresis C07K1/26 )**

### Definition statement

*This subclass/group covers:*

Production of compounds or non-metals where the process includes a step of reduction or oxidation of the material forming the compound or non-metal, e.g.

formation of a polymer.

### References relevant to classification in this group

*This subclass/group does not cover:*

Separation or purification of peptides, e.g. of proteins, by electrophoresis	<a href="#">C07K 1/26</a>
Electrocoating, when the coating is only deposited and not produced by an electrolytic reaction	<a href="#">C25D 13/04</a>

## C25B 9/00

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

### Definition statement

*This subclass/group covers:*

Cells used for the electrolytic production processes which are defined in other subgroups of [C25B](#).

### References relevant to classification in this group

*This subclass/group does not cover:*

Devices for the electrolytic treatment of water or sewage	<a href="#">C02F 1/46104</a>
The combination of an electrolytic cell with a combustor to improve combustion.	<a href="#">F02B 43/10</a>

### 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>
Reversible fuel cells	<a href="#">H01M 8/18</a>

## Glossary of terms

*In this subclass/group, 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 9/04

**Devices for current supply; Electrode connections; Electric inter-cell connections**

### Definition statement

*This subclass/group covers:*

Devices and connections which are monopolar.

### References relevant to classification in this group

*This subclass/group does not cover:*

Bipolar plates for electrolytic cells	<a href="#">C25B 9/203</a>
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### Informative references

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

Electrical connections in general	<a href="#">H01R</a>
Electrical connections in fuel cells or storage batteries	<a href="#">H01M 8/02</a> , <a href="#">H01M 2/20</a>

## C25B 9/06

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

### Definition statement

*This subclass/group covers:*

Cells comprising dimensionally stable non-movable electrodes not covered by

[C25B 9/063](#) to [C25B 9/10](#).

## Glossary of terms

*In this subclass/group, 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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## C25B 9/063

**[N: including bipolar electrodes]**

### Definition statement

*This subclass/group covers:*

Cells comprising dimensionally stable non-movable electrodes, further including one or more bipolar electrodes, which are not covered by [C25B 9/066](#) to [C25B 9/10](#)

## Glossary of terms

*In this subclass/group, the following terms (or expressions) are used with the meaning indicated:*

Bipolar electrode	Field electrode, i.e. an electrode which is positioned in the 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 which faces the cathode acts as an anode and the other side which faces the anode acts as a cathode
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## C25B 9/10

**including an ion-exchange membrane in or on which electrode material is embedded**

### Definition statement

*This subclass/group covers:*  
Membrane-electrode assemblies (MEA).

## **C25B 9/12**

**Cells or assemblies of cells comprising at least one movable electrode; Assemblies of constructional parts thereof**

### **Definition statement**

*This subclass/group covers:*  
Movable electrode, be it electrodes that move in space or electrodes that move around an axis, such as rotary electrodes.

## **C25B 9/16**

**Cells or assemblies of cells comprising at least one electrode made of particles; Assemblies of constructional parts thereof**

### **Definition statement**

*This subclass/group covers:*  
Electrodes comprising a bed of electrically conductive particles which are arranged such that they at least temporarily touch each other and an electrical conductor (a net, a plate etc.) which provides connection to a power source.

### **References relevant to classification in this group**

*This subclass/group does not cover:*

Electrodes in particulate form for treatment of water or waste water or sewage	<a href="#">C02F 1/46114</a>
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## **C25B 9/162**

**[N: comprising fluidised bed electrodes]**

### **Definition statement**

*This subclass/group covers:*  
Electrodes that comprise a bed of electrically conductive particles which are in motion, such that they only temporarily touch each other and the electrical conductor.

## C25B 9/166

[N: comprising static bed electrodes]

### Definition statement

*This subclass/group covers:*

Electrodes that comprise a bed of electrically conductive particles which rest, such that they continually touch each other and the electrical conductor.

### Synonyms and Keywords

In patent documents the following expressions/words " fixed bed electrode " and " static bed electrode " are used as synonyms.

## C25B 9/18

**Assemblies comprising a plurality of cells ([N: C25B9/005 takes precedence]; assemblies of cells with movable electrodes C25B9/12; assemblies of cells with electrodes made of particles C25B9/16 )**

### References relevant to classification in this group

*This subclass/group does not cover:*

Assemblies of cells with movable electrodes	<a href="#">C25B 9/12</a>
Assemblies of cells with electrodes made of particles	<a href="#">C25B 9/16</a>

### Special rules of classification within this group

[C25B 9/005](#) takes precedence.

## C25B 9/20

**of the filter-press type**

### Definition statement

*This subclass/group covers:*

Assemblies of the filter-press type comprising a plurality of cells, e.g. electrodes are arranged vertically in a stack of vertical frames defining the electrolysis chamber(s)

## Glossary of terms

*In this subclass/group, the following terms (or expressions) are used with the meaning indicated:*

Filter-press type cells	generally consist of a stack of vertical frames which define electrolysis chambers in which electrodes are arranged vertically
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## C25B 9/203

**[N: with bipolar electrodes]**

### Definition statement

*This subclass/group covers:*

Assemblies of the filter-press type comprising a plurality of cells with bipolar electrodes, e.g. the bipolar electrodes are arranged vertically in a stack of vertical frames defining the electrolysis chamber(s).

## Glossary of terms

*In this subclass/group, the following terms (or expressions) are used with the meaning indicated:*

Bipolar electrode	field electrode, i.e. an electrode which is positioned in the 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 which faces the cathode acts as an anode and the other side which faces the anode acts as a cathode
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## C25B 11/00

**Electrodes; Manufacture thereof not otherwise provided for**

### Definition statement

*This subclass/group covers:*

Electrodes used for the electrolytic or electrochemical production processes

which are defined somewhere in [C25B](#).

## References relevant to classification in this group

*This subclass/group does not cover:*

Electrodes for treatment of water or sewage	<a href="#">C02F 1/46109</a>
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## Informative references

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

Photoelectrodes	<a href="#">B01J 35/004</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>

## Special rules of classification within this group

The electrodes corresponding to IPC [C25B 11/06](#) - [C25B 11/10](#) are classified in [C25B 11/04](#).

### **C25B 11/02**

**characterised by shape or form**

#### **Definition statement**

*This subclass/group covers:*

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

### **C25B 11/03**

**perforated or foraminous**

#### **Definition statement**

*This subclass/group covers:*



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

## C25B 11/035

### Porous electrodes

#### References relevant to classification in this group

*This subclass/group does not cover:*

Gas diffusion electrodes (GDE)	<a href="#">H01M 4/86</a> , <a href="#">H01M 8/02</a>
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## C25B 11/0405

[N: of electrodes having a substrate and a coating]

#### Glossary of terms

*In this subclass/group, the following terms (or expressions) are used with the meaning indicated:*

Substrate	the bulk of the electrode, also including inevitable oxide layers which are present in particular on the valve metals
Coating	all layers on the substrate, i.e. not only the electrocatalytic coating (which is usually on top and in contact with the electrolyte), but also intermediate layers (also those oxide layers which are not inevitable but formed on purpose on the substrate)

## C25B 11/12

### Electrodes based on carbon

#### Definition statement

*This subclass/group covers:*

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

Diamond electrodes which are completely made of diamond, i.e. which are not a substrate with a diamond coating, are also covered

## References relevant to classification in this group

*This subclass/group does not cover:*

Diamond electrodes used in treatment of water, waste water etc.	<a href="#">C02F 1/46109</a> <a href="#">C02F 2001/46133</a>
Electrodes which comprise carbon either as the substrate or a coating	<a href="#">C25B 11/0405</a>
Diamond electrodes which comprise a diamond coating on a substrate	<a href="#">C25B 11/0447</a>

## Informative references

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

Carbon masses	<a href="#">C04B 35/52</a>
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## C25B 11/16

**Electrodes based on manganese dioxide or lead dioxide [N: (C25B11/0405 takes precedence)]**

## References relevant to classification in this group

*This subclass/group does not cover:*

Electrodes which comprise manganese dioxide or lead dioxide either as the substrate or a coating	<a href="#">C25B 11/0405</a>
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## C25B 11/18

**Mercury or amalgam electrodes [N: (C25B11/0405 takes precedence)]**

## References relevant to classification in this group

*This subclass/group does not cover:*

Electrodes which comprise mercury or amalgam either as the substrate or a coating	<a href="#">C25B 11/0405</a>
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## C25B 13/00

### Diaphragms; Spacing elements

#### Definition statement

*This subclass/group covers:*

Structural material used to separate the electrodes of an electrolytic or electrophoretic cell, thereby forming two or more compartments, allowing the flow of an electrolytic solution or the migration of particular ions, but preventing the complete intermingling of the two solutions or the migration of all kinds of ions.

#### Informative references

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

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

#### Synonyms and Keywords

In patent documents the following expressions/words "diaphragm " and " membrane" are used as synonyms.

## C25B 13/04

### characterised by the material

#### Informative references

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

Solid state electrolytes for fuel cells, characterized 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

### Relationship between large subject matter areas

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 of cells

### Definition statement

*This subclass/group 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 (controlling or regulating in general G05)

### Informative references

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

Controlling or regulating in general	G05
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## C25B 15/04

Regulation of the inter-electrode distance (electro-machining B23P)

### Relationship between large subject matter areas

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