

C25D

PROCESSES FOR THE ELECTROLYTIC OR ELECTROPHORETIC PRODUCTION OF COATINGS; ELECTROFORMING (decorating textiles by metallising [D06Q 1/04](#); manufacturing printed circuits by metal deposition [H05K 3/18](#)); APPARATUS THEREFOR

Definition statement

This place covers:

Electroforming.

Electroplating, baths therefor.

Electroplating characterized by the process; pretreatment or after-treatment of workpieces.

Electroplating characterized by the article coated.

Electrolytic coating other than with metals.

Electrolytic coating by surface reaction, reforming conversion layers.

Electrophoretic coating.

Electrolytic or electrophoretic production of coating containing embedded materials, e.g. particles, whiskers, wires.

Constructional parts, or assemblies thereof, of cells for electrolytic coating.

Electrolytic coating plants.

Plants for servicing or operating cells for electrolytic coating.

Relationships with other classification places

- 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 [C23F 17/00](#).
- Coating for obtaining at least two superposed coatings by combination of methods provided for in subclasses [C23C](#) and [C25D](#) are classified in [C23C 28/00](#).
- 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](#).
- Electrolytic production or recovery of metals and alloys from solutions or melts is classified in [C25C](#)
- Processes and apparatuses for electrochemical removal of materials from object, e.g. etching, polishing, brightening are classified in [C25F](#).
- 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:

Laminating metals	B32B 15/00
Treatment of water, waste water, or sewage by electrochemical means, e.g. electrolysis	C02F 1/46

Compositions for electrophoretic coating of polymers	C09D 5/44
Inhibition of corrosion by anodic or cathodic protection	C23F 13/00
Single crystal growth	C30B

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:

Metallising textile	D06M 11/83
Decorating textiles by locally metallising	D06Q 1/04
Manufacturing printed circuits by metal deposition	H05K 3/18

Informative references

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

Lacquering	B44D
Apparatus for continuously conveying articles into bath	B65G 49/00
Nanostructures	B82B 3/00
Electroless plating	C23C 18/16
Chemical conversion coating	C23C 22/00
Coating for obtaining at least two superposed coatings either by methods not provided for in a single one of groups C23C 2/00 - C23C 26/00 or by combinations of methods provided for in subclasses C23C and C25D	C23C 28/00
Electrolytic etching, polishing, brightening	C25F
Electrolytic coating of blades, turbines	F01D 5/00
Measuring thickness	G01B
Electrochemical methods of analysis	G01N 27/26
Controlling or regulating	G05B
Magnetic heads	G11B 5/00
Cables, conductors, insulators	H01B , H01R
Capacitors	H01G 9/00
Semiconductors, wafers	H01L 21/00
Solar Cells	H01L 31/00
Installation of electrical cables or lines	H02G
Manufacturing of printed circuit board by metal deposition	H05K 3/18

C25D 1/00

Electroforming

Definition statement

This place covers:

Electroforming processes, i.e. processes involving the reproduction or formation of objects by electrodeposition in which the deposit does not permanently remain with the base upon which deposition is made, e.g.:

- Electroforming of tubes, wires, moulds
- Electroforming of 3D-structures, 3D-systems
- Electroforming of nanostructures, like aluminum AAO templates or arrays
- Electroforming by electrophoresis

References

Limiting references

This place does not cover:

Layered products comprising essentially metals	B32B 15/00
Single crystal growth	C30B

Informative references

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

Nanostructures (AAO)	B82B 3/00
Measuring thickness	G01B
Controlling or regulating	G05B
Cables, conductors, insulators	H01B , H01R
Installation of electrical cables or lines	H02G

Special rules of classification

AAO templates when they are used as moulds for electroforming nanostructures are considered as devices for electroforming and are classified in [C25D 1/00](#). The electroformed nanostructures are classified in [C25D 1/006](#).

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

AAO	Aluminum Anodic Oxidation, for anodised aluminum templates or arrays, which may serve as moulds for manufacturing nanowires
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C25D 3/00

Electroplating: Baths therefor

Definition statement

This place covers:

Baths for electroplating, e.g solutions, melts and also solid electrolytes used in the bath.

References

Informative references

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

Electroless plating baths	C23C 18/00
Electrolytic etching, polishing, brightening	C25F

C25D 3/40

from cyanide baths {, e.g. with Cu+}

Definition statement

This place covers:

Electroplating solutions of copper cyanide baths.

C25D 3/56

of alloys

Definition statement

This place covers:

Liquid electrolytic bath for plating alloys, e.g. alloys containing more than 50% by weight of iron, nickel or cobalt or more than 50% by weight of zinc or more than 50% by weight of platinum group metals or also NiP, CoP alloys

C25D 3/60

containing more than 50% by weight of tin {; SnP}

Definition statement

This place covers:

Liquid electrolytic bath for tin alloys, also SnP alloys.

C25D 3/66

from melts

Definition statement

This place covers:

Electrolytic bath from melts of fused baths, from ionic liquids, e.g. molten salt baths.

Glossary of terms

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

Melt	molten salt or ionic liquid or fused bath
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C25D 5/00

Electroplating characterised by the process; Pretreatment or after-treatment of workpieces

Definition statement

This place covers:

Aspects of the electroplating process, including preparation of workpiece for electroplating and further work after electroplating. However, certain aspects are directly classified in the relevant subgroup [C25D 5/003-C25D 5/56](#), e.g. the pretreatment of metallic surfaces directly classified in [C25D 5/34](#)

References

Limiting references

This place does not cover:

Selective plating of , spraying of electrolyte for and regulating thickness of conveyed wires, strips or foils, e.g. using masks	C25D 7/06
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Informative references

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

Coating for obtaining at least two superposed coatings either by methods not provided for in a single one of groups C23C 2/00 - C23C 26/00 or by combinations of methods provided for in subclasses C23C and C25D	C23C 28/00
Electrolytic etching, polishing, brightening	C25F
Controlling or regulating	G05B

Special rules of classification

The following Subgroups of IPC are not used in the CPC classification scheme. Subject matter covered by those groups is classified as the following:

C25D5/24 is covered by [C25D 5/34](#).

C25D5/26 is covered by [C25D 5/36](#).

C25D5/28 is covered by [C25D 5/38](#) and [C25D 5/40](#).

C25D5/30 is covered by [C25D 5/42](#) and [C25D 5/44](#).

C25D5/32 is covered by [C25D 5/46](#).

C25D 5/08

Electroplating with moving electrolyte {, characterised by electrolyte flow}, e.g. jet electroplating {(spraying of electrolyte on wires strip or foils [C25D 7/0642](#), means or devices for moving the electrolyte [C25D 21/10](#), [C25D 5/026](#) takes precedence)}

Definition statement

This place covers:

Electroplating with moving electrolyte, e.g. for plating at high current densities.

C25D 5/16

Electroplating with layers of varying thickness {, e.g. rough surfaces}{; Hull cells}

Definition statement

This place covers:

- Electroplating processes wherein the thickness of the deposit obtained is purposely not uniform all over the substrate (e.g. thickness increasing in one direction, like in a Hull cell)
- Electroplating processes wherein the rough aspect of the deposit obtained is purposive.

C25D 5/54

Electroplating {on} non-metallic surfaces {, e.g. on carbon or carbon composites} ([C25D 7/12](#) takes precedence)

Definition statement

This place covers:

Electroplating on non-metallic surfaces , e.g. carbon or carbon composites, not on a seed layer.

C25D 5/56

on {thin or conductive} plastics {(coating metallic material [C23C](#))}

Definition statement

This place covers:

On plastics (when the plastic layer is thin, or the plastic is conductive).

C25D 7/00

Electroplating characterised by the article coated

Definition statement

This place covers:

Articles coated by electroplating. However, certain articles are directly classified in the relevant subgroups [C25D 7/001-C25D 7/126](#), e.g. mirrors, reflectors are classified in [C25D 7/08](#).

References

Limiting references

This place does not cover:

Laminating metals	B32B 15/00
Electroplating wafers comprising a seed layer	C23C 28/02 , H01L 21/00
Electroplating solar cells comprising a seed layer	C23C 28/02 , H01L 31/00

Informative references

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

Electrolytic coating of blades, turbines	F01D 5/00
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Magnetic heads	G11B 5/00
Cables, conductors, insulators	H01B 13/0033 , H01R
Capacitors	H01G 9/00
Semiconductors, wafers	H01L 21/00
Solar Cells	H01L 31/00
Installation of electrical cables or lines	H02G
Printed circuit board	H05K 3/00

C25D 7/06

Wires; Strips; Foils

Definition statement

This place covers:

wires strips or foils,

- plated in horizontal cells
- in vertical cells
- in radial cells
- characterised by the anode used,
- the diaphragms used,
- the conducting rolls used ,
- the isolating rolls used,
- selective plating (using masks),
- spraying of electrolyte,
- regulating the thickness of the coating

Special rules of classification

Apparatus for electroplating metallic strips or foils are classified in [C25D 7/06](#) subgroups only when relevant subgroups, e.g. radial cells, are available. If no relevant subgroups are available, then apparatus for electroplating metallic strips or foils are classified in [C25D 7/06](#) or [C25D 7/06](#) and [C25D 17/00](#) subgroups

C25D 7/10

Bearings

Definition statement

This place covers:

Antifriction means, as balls, or rollers, designed to receive a rotating shaft, or to be used in connection with a pivoted, sliding, or rotary element.

C25D 7/12

Semiconductors

Definition statement

This place covers:

Only electroplating directly onto a semiconductor or wafer or solar cell.

C25D 9/00

Electrolytic coating other than with metals ([C25D 11/00](#), [C25D 15/00](#) take precedence; electrophoretic coating [C25D 13/00](#))

Definition statement

This place covers:

Electrolytic coating with other materials than metals, e.g. organic materials, inorganic materials e.g. plating with ZnO from a solution comprising Zn²⁺ ions and OH⁻ ions and by varying the pH.

References

Limiting references

This place does not cover:

Electrophoretic coating in general	C25D 13/00
Lacquering	B44D
Anodic or cathodic protection (inhibit corrosion)	C23F 13/00
Single crystal growth	C30B

Informative references

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

Plating of hydroxyapatite, for dental implants	A61L 27/32 , A61K 6/083
Measuring thickness	G01B
Controlling or regulating	G05B

C25D 11/00

Electrolytic coating by surface reaction, i.e. forming conversion layers

Definition statement

This place covers:

Electrolytic coating by surface reaction with formation of conversion layers, which often serve as passivation layers. However, certain processes are directly classified in the relevant subgroups [C25D 11/02](#)-[C25D 11/38](#), e.g. anodisation of refractory metals are classified in [C25D 11/26](#).

References

Limiting references

This place does not cover:

Electroplating with an oxide, not a conversion of the surface	C25D 9/00
Coating with an oxide by electromigration of charged particles	C25D 13/02
Chemical surface treatment of metallic material by reaction of the surface (chemical conversion), like phosphatising or chromatising	C23C 22/00
Inhibit corrosion of metals by anodic or cathodic protection	C23F 13/00
Electrolytic removal of materials (etching, polishing, cleaning)	C25F
Manufacturing of printed circuit board by metal deposition	H05K 3/18

Informative references

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

Controlling or regulating	G05B
Semiconductors, wafers	H01L 21/00

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

AAO	Aluminum Anodic Oxidation
ANOF	Anodic oxidation by spark discharge

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

- "anodic oxidation", "anodisation", "electrochemical conversion coating" and "eloxieren"

C25D 11/16**Pretreatment {, e.g. desmutting}****Definition statement**

This place covers:

Pretreatment of the electrolytic coated surface, e.g. desmutting.

Glossary of terms

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

Desmutting	Removal of smut layer formed after etching a metal or an alloy
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C25D 11/18**After-treatment, e.g. pore-sealing****Definition statement**

This place covers:

After treatment of electrolytic coated surface, e.g., physical or chemical after treatment, e.g. using organic dyestuffs, for sealing layers.

C25D 11/36**Phosphatising {, e.g. NiP, CoP, FeP (bath solutions of NiP, CoP, FeP [C25D 3/562](#))}****Definition statement**

This place covers:

The electrochemical process of forming an adherent phosphate coating on a metal substrate by immersion thereof in a suitable aqueous phosphate solution and precipitation of insoluble metal phosphate compounds upon increase of the pH in the vicinity of the substrate, wherein part of the metal substrate reacts with the solution to form the coating. A metal source other than the substrate may be added to the solution, e.g. precipitation of zinc phosphate on steel substrate, thereby limiting the actual contribution of the metal of the substrate to the coating formation.

Special rules of classification

The classification in [C25D 11/36](#) implies a surface reaction, typically the acidic/anodic dissolution of the metal surface to form a metal phosphate coating, i.e. a conversion coating.

If the contribution of the metal of the surface to the formation of the coating is not explicit, for instance in the case of a cathodic process wherein a base is generated at the cathode to allow precipitation, the process will nevertheless be classified in [C25D 11/36](#).

If it is explicit that the metal surface is not attacked by the phosphatising solution, such a precipitation process is classified in the relevant [C25D 9/04](#) subgroup only.

In case of doubt, it is classified in both.

C25D 13/00

Electrophoretic coating characterised by the process ([C25D 15/00](#) takes precedence; compositions for electrophoretic coating [C09D 5/44](#))

Definition statement

This place covers:

Processes wherein charged particles or molecules suspended or dissolved in a liquid medium, forming a solution, a dispersion or a colloid, migrate under the influence of an electric field and are deposited onto an electrode. However, certain aspects are directly classified in the relevant subgroups [C25D 13/02-C25D 13/24](#), e.g. electrophoretic deposition of low molecular weight organic compounds, non polymeric and non polymerisable compounds are classified in [C25D 13/04](#).

References

Limiting references

This place does not cover:

Electrolytic coating other than with metals, by deposition of ions, not through electromigration	C25D 9/00
Electrolytic or electrophoretic production of coating containing embedded materials	C25D 15/00
Lacquering	B44D
Compositions for electrophoretic coating of polymers, , e.g. electrografting	C09D 5/44 , C09D 5/4476

Informative references

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

Apparatus for continuously conveying articles into bath	B65G 49/00
Measuring thickness	G01B
Controlling or regulating	G05B

C25D 13/22

Servicing or operating {apparatus or multistep processes}

Definition statement

This place covers:

Servicing and operating; apparatus and multistep processes.

C25D 15/00

Electrolytic or electrophoretic production of coatings containing embedded materials, e.g. particles, whiskers, wires

Definition statement

This place covers:

- Processes wherein a matrix of a first material is formed by electrodeposition onto an electrode (see definitions of [C25D 5/00](#) and [C25D 9/00](#)) and wherein supplemental substances of at least a second material such as powders, filings, or threads are added to the bath and get entrapped into the matrix upon formation thereof.
- Processes wherein a matrix of a first material is formed on a substrate by an electrolytic coating process involving the reaction of the surface (see definition of [C25D 11/00](#)) and wherein supplemental substances of at least a second material such as powders, filings, or threads are added to the bath and get entrapped into the matrix upon formation thereof.
- Processes wherein a matrix of a first material is formed on a substrate by electrophoretic coating (see the definition of [C25D 13/00](#)) and wherein supplemental substances of at least a second material such as powders, filings, or threads are added to the liquid and get entrapped into the matrix upon formation thereof.

However, when electrophoretic and electrolytic processes are concomittant, the global process is directly classified in [C25D 15/02](#).

References

Limiting references

This place does not cover:

Lacquering comprising pigments	B44D
Compositions for electrophoretic coating of copolymers	C09D 5/44

Special rules of classification

When the coating is a self-supporting article, it is classified only in [C25D 1/00](#)

C25D 15/02

Combined electrolytic and electrophoretic processes {with charged materials}

Definition statement

This place covers:

Processes involving the formation of a matrix containing supplemental embedded substances (see the definition of [C25D 15/00](#)) wherein said supplemental substances are not only passively entrapped in the matrix but are actively involved in an electrophoretic or electrolytic deposition process, e.g.

processes wherein the formation of the matrix by electroplating and the migration of the supplemental substances to the cathode by electrophoresis take place concomitantly.

C25D 17/00

Constructional parts, or assemblies thereof, of cells for electrolytic coating (apparatus for continuously conveying articles into baths [B65G](#), e.g. [B65G 49/00](#); electric devices see the relevant classes, e.g. [H01B](#), [H02G](#))
{{[C25D 7/06](#), [C25D 11/005](#), [C25D 13/22](#), [C25](#) takes precedence}}

Definition statement

This place covers:

- Apparatuses for electroplating and electrolytic conversion plating of [C25D 11/00](#)
- Apparatuses for plating wafers
- Sealing device, cell separation, contacting devices, current directing device, current shielding device, indirect electrode contact.

References

Limiting references

This place does not cover:

Apparatus for electroplating conveyed wires, strips or foils characterised by anodes, diaphragms, conducting rolls, isolating rolls	C25D 7/06
Apparatus for electrophoretic coating	C25D 13/22
Apparatus for electroless plating	C23C 18/16

Informative references

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

Apparatus for continuously conveying articles into bath	B65G 49/00
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Special rules of classification

Electrolytic coating plants are classified in this group, **C25D19/00** is not used.

Apparatus for electroplating metallic strips or foils are classified in [C25D 7/06](#) subgroups only when relevant subgroups, e.g. radial cells, are available. If no relevant subgroups are available, then apparatus for electroplating metallic strips or foils are classified in [C25D 7/06](#) or [C25D 7/06](#) and [C25D 17/00](#) subgroups

Apparatus for electroplating tubes, hollow bodies are classified in [C25D 7/04](#)

Synonyms and Keywords

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

- "barrels" and "drums"

C25D 17/08**{Supporting} racks {, i.e. not for suspending}****Definition statement***This place covers:*

Racks, for supporting, not suspending.

C25D 17/10**Electrodes {, e.g. composition, counter electrode}****Definition statement***This place covers:*

Electrodes (composition, counter electrode).

Special rules of classification

This group is the principal group for electrodes. If the electrode concerns an electrode for electroplating, electrolytic coating by surface reaction or electrophoretic coating, it is then also classified in those groups.

C25D 21/00**Processes for servicing or operating cells for electrolytic coating****Relationships with other classification places**

Processes and apparatus for electrolytic production or recovery of metals and alloys from solutions or melts are classified in [C25C](#)

Processes and apparatuses for electrochemical removal of materials from object, e.g. etching, polishing, brightening are classified in [C25F](#).

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

Measuring thickness of coating with piezo, capacity, magnetically	G01B 7/06 , G01B 7/08 , G01B 7/10
Measuring thickness of coating	G01B 11/06
Measuring thickness of coating with radiation	G01B 15/02
Measuring thickness of coating with sonic vibration	G01B 17/02
pH sensor or regulator	G01N 27/416
Arrangements for measuring current density	G01R 19/08
Process control or regulation in general	G05B

C25D 21/04

Removal of gases or vapours {; gas or pressure control (electroplating characterized by the use of gases [C25D 5/003](#))}

Definition statement

This place covers:

Removal of gases or vapours and pressure control in general.

C25D 21/06

Filtering {particles other than ions (filtering ions [C25D 21/22](#))}

Definition statement

This place covers:

Filtering particles, not ions.

C25D 21/10

Agitating of electrolytes; Moving of racks

Definition statement

This place covers:

Method of roiling the aqueous solution for electrolytic coating or of displacing the supports for the article to be treated.

Special rules of classification

Electroplating with moving electrolyte is classified in [C25D 5/08](#).

C25D 21/22

by ion-exchange

Definition statement

This place covers:

Regenerations of process solutions by ion exchange, filtering ions, not particles

Synonyms and Keywords

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

- " regeneration " and " replenish "