

CPC**COOPERATIVE PATENT CLASSIFICATION****H01M****PROCESSES OR MEANS, e.g. BATTERIES, FOR THE DIRECT CONVERSION OF CHEMICAL INTO ELECTRICAL ENERGY**

(electrochemical processes or apparatus in general [C25](#) ; semiconductor or other solid state devices for converting light or heat into electrical energy [H01L](#) , e.g. [H01L 31/00](#), [H01L 35/00](#), [H01L 37/00](#))

NOTE

This subclass covers galvanic primary or secondary cells or batteries, fuel cells or batteries.

H01M 2/00**Constructional details or processes of manufacture of the non-active parts**

- H01M 2/02 . Cases, jackets or wrappings ([working of plastics or substances in plastic stateB29](#))
- H01M 2/0202 . . {for small-sized cells or batteries, e.g. miniature battery or power cells, batteries or cells for portable equipment ([H01M 2/025](#) takes precedence) }
- H01M 2/0207 . . . { Flat-shaped cells or batteries of flat cells ([H01M 2/0222](#) takes precedence) }
- H01M 2/021 {with both terminals passing through the case or cover }
- H01M 2/0212 {with plate-like or sheet-like terminals ([H01M 2/0215](#) takes precedence) }
- H01M 2/0215 {with window-shaped terminals }
- H01M 2/0217 . . . { Cases of prismatic shape }
- H01M 2/022 . . . { Cases of cylindrical or round shape }
- H01M 2/0222 { Button or coin cell cases }
- H01M 2/0225 { with cup-shaped terminals }
- H01M 2/0227 { with both cup-shaped terminals }
- H01M 2/023 { with one cup-shaped terminal }
- H01M 2/0232 { with a passing-through terminal ([H01M 2/0235](#) takes precedence) }
- H01M 2/0235 { with a collector centrally disposed in the active mass, e.g. Leclanch cells }
- H01M 2/0237 . . {for large-sized cells or batteries, e.g. L.I.S. batteries, traction or motive power type or standby power batteries ([H01M 2/025](#) takes precedence) }
- H01M 2/024 . . . {Details }
- H01M 2/0242 . . . {Monobloc manufactured cases comprising multiple compartments }
- H01M 2/0245 . . . {Assembly of different cases, i.e. modular battery or cases particularly provided with means for assembling }
- H01M 2/0247 {sealed to each other in a non-detachable manner }
- H01M 2/025 . . {for cells or batteries working under specific conditions such as high temperature, gas diffusion, external electrolyte circulation, external supply of reactants }
- H01M 2/0252 . . . {High- temperature cells or batteries, e.g. Na-S cells, Li-Cl₂ cells }
- H01M 2/0255 . . . { Hybrid cells or batteries ([H01M 2/0222](#) takes precedence) }
- H01M 2/0257 . . {characterised by the material }
- H01M 2/026 . . . { for small-sized cells or batteries, batteries or cells for portable equipment }

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| H01M 2/0262 | ... | { for large-sized cells or batteries, batteries or cells for traction or motive power or standby power } |
| H01M 2/0265 | ... | {for high-temperature cells } |
| H01M 2/0267 | ... | { of wrappings, outside coatings, jackets around completely closed cell elements } |
| H01M 2/027 | ... | { Casing material forming terminal of the cell } |
| H01M 2/0272 | .... | { characterized by the internal coating or internal conductive layer } |
| H01M 2/0275 | ... | { of flexible envelopes or bags around open cell elements } |
| H01M 2/0277 | ... | { Insulating material (H01M 2/029 takes precedence) } |
| H01M 2/028 | .... | { being one layer } |
| H01M 2/0282 | ..... | { having particulate or reinforced material } |
| H01M 2/0285 | ... | { Conductive material } |
| H01M 2/0287 | ... | { comprising layers } |
| H01M 2/029 | .... | { consisting only of insulating material } |
| H01M 2/0292 | .... | { characterised by the external coating on the casing } |
| H01M 2/0295 | ... | { Composite material consisting of mixed or dispersed phases } |
| H01M 2/04 | .. | Lids or covers |
| H01M 2/0404 | ... | { for small-sized cells or batteries, e.g. miniature battery or power cells, batteries or cells for portable equipment (H01M 2/0443 takes precedence) } |
| H01M 2/0408 | .... | { Crimp-sealed cells or batteries; Cells or batteries with turned-over edges } |
| H01M 2/0413 | ..... | { provided with an intermediary sealing member between the crimped or curled edges (H01M 2/0417 takes precedence) } |
| H01M 2/0417 | ..... | { comprising an insulating cover provided with an axial bore for receiving a central current collector } |
| H01M 2/0421 | ..... | { with an external conductive cover } |
| H01M 2/0426 | .... | { with a metallic cover of which the borders are soldered or welded with the case } |
| H01M 2/043 | ... | { for large-sized cells or batteries, e.g. LIS batteries, traction or motive power type or standby power batteries (H01M 2/0443 takes precedence) } |
| H01M 2/0434 | .... | { Methods for assembling case and cover } |
| H01M 2/0439 | ..... | { without provisions for disassembling } |
| H01M 2/0443 | ... | { for cells or batteries working under specific conditions such as high temperature, gas diffusion, external electrolyte circulation, external supply of reactants } |
| H01M 2/0447 | .... | { High-temperature cells or batteries } |
| H01M 2/0452 | .... | { Hybrid cells or batteries } |
| H01M 2/0456 | ... | { characterised by the shape } |
| H01M 2/046 | .... | { Disk-like lids for cylindrical batteries } |
| H01M 2/0465 | ..... | { Button cell lids } |
| H01M 2/0469 | .... | { Lids for flat or sheet-like batteries } |
| H01M 2/0473 | .... | { Lids for prismatic cells } |
| H01M 2/0478 | ... | { characterised by the material } |
| H01M 2/0482 | .... | { Insulating materials } |
| H01M 2/0486 | .... | { Conducting materials } |
| H01M 2/0491 | .... | { characterised by the coating } |

- H01M 2/0495 { Conductive coating material }
- H01M 2/06 .. Arrangements for introducing electric connectors into or through cases
- H01M 2/065 ... { using glass or ceramic sealing material }
- H01M 2/08 .. Sealing materials

- H01M 2/10 . Mountings; Suspension devices; Shock absorbers; Transport or carrying devices; Holders (structural combination of accumulators with charging apparatus [H01M 10/46](#))
- H01M 2/1005 .. {Carrying devices }
- H01M 2/1011 ... {using the terminals or connecting links }
- H01M 2/1016 .. { Cabinets, cases, fixing devices, adapters, racks or battery packs }
- H01M 2/1022 ... { for miniature batteries or batteries for portable equipment (batteries in portable systems [H01M 2220/30](#)) }
- H01M 2/1027 { with the possibility of incorporating batteries of different sizes }
- H01M 2/1033 { providing adapters around the batteries }
- H01M 2/1038 {for button cells }
- H01M 2/1044 {forming a whole with or incorporated in or fixed to the electronic appliance }
- H01M 2/105 {for cells of cylindrical configuration }
- H01M 2/1055 {forming a whole with or incorporated in or fixed to the electronic appliance }
- H01M 2/1061 {for cells of prismatic configuration or for sheet-like batteries }
- H01M 2/1066 {forming a whole with or incorporated in or fixed to the electronic appliance }
- H01M 2/1072 ... { for starting, lighting or ignition batteries; Vehicle traction batteries; Stationary or load leading batteries (batteries in stationary systems [H01M 2220/10](#), batteries in motive systems [H01M 2220/20](#)) }
- H01M 2/1077 {Racks, groups of several batteries ([H01M 2/1088](#) takes precedence) }
- H01M 2/1083 {Fixing on vehicles }
- H01M 2/1088 {for accumulators working at high temperature }
- H01M 2/1094 .. {Particular characteristics of materials used to isolate the battery from its environment, e.g. thermal insulation, corrosion resistance, pressure resistance, electrolyte leakage }

- H01M 2/12 . Vent plugs or other mechanical arrangements for facilitating escape of gases
- H01M 2/1205 .. {Vent arrangements incorporated in vent plugs or multiplug systems detachable from the battery or cell }
- H01M 2/1211 ... {Multiplug systems or arrangements; Plurality of plugs surrounded by a common cover }
- H01M 2/1217 {in the shape of a one-piece member }
- H01M 2/1223 .. { Vent arrangements of resealable design ([H01M 2/1205](#), [H01M 2/1247-H01M 2/1294](#) take precedence) }
- H01M 2/1229 ... {comprising a deformable, elastic or flexible valve member }
- H01M 2/1235 .. { Emergency or safety arrangements of non-resealable design ([H01M 2/1205](#), [H01M 2/1247-H01M 2/1294](#) take precedence) }
- H01M 2/1241 ... {in the form of rupturable membranes or weakened parts, e.g. pierced with the aid of a sharp member }
- H01M 2/1247 .. {Explosion- or splash-preventing means contained in the head space of the battery,

- e.g. means floating on the electrolyte }
- H01M 2/1252 .. {comprising elongated, tortuous or labyrinth-shaped exhaust passages in the battery cover or case; Double cover vent systems }
- H01M 2/1258 .. { containing electrolyte neutralising or absorbing means }
- H01M 2/1264 .. { comprising gas-pervious parts or elements }
- H01M 2/127 ... { as flame arrester or ignition preventing means }
- H01M 2/1276 .. { Spring-loaded vent valves }
- H01M 2/1282 .. { Thermally responsive or sensitive vent means }
- H01M 2/1288 .. { Film- or sheet-like elastic valve members optionally coated with non-drying glue }
- H01M 2/1294 .. { Slit, perforated or punctured elastic valve members }

- H01M 2/14 . Separators; Membranes; Diaphragms; Spacing elements
- H01M 2/145 .. { Manufacturing processes }
- H01M 2/16 .. characterised by the material
- H01M 2/1606 ... {comprising fibrous material }
- H01M 2/1613 {Inorganic fibrous material }
- H01M 2/162 {Organic fibrous material }
- H01M 2/1626 {Natural fibres, e.g. cotton, cellulose }
- H01M 2/1633 {Mixtures of inorganic and organic fibres }
- H01M 2/164 ... {comprising non-fibrous material ([H01M 2/1606](#) takes precedence) }
- H01M 2/1646 {Inorganic non-fibrous material }
- H01M 2/1653 {Organic non-fibrous material }
- H01M 2/166 {Mixtures of inorganic and organic non-fibrous material }
- H01M 2/1666 ... {comprising a non-fibrous layer and a fibrous layer superimposed on one another }
- H01M 2/1673 ... {Electrode-separator combination }
- H01M 2/168 { with adhesive layers between electrodes and separators }
- H01M 2/1686 ... { Separators having two or more layers of either fibrous or non-fibrous materials }
- H01M 2/1693 ... {Wood }
- H01M 2/18 .. characterised by the shape
- H01M 2/185 ... { Separators made of one single microscopic fiber }

- H01M 2/20 . Current conducting connections for cells
- H01M 2/202 .. {Interconnectors for or interconnection of the terminals of adjacent or distinct batteries or cells }
- H01M 2/204 ... {of small-sized cells or batteries, e.g. miniature battery or power cells, batteries or cells for portable equipment }
- H01M 2/206 ... {of large-sized cells or batteries, e.g. L.I.S. batteries, traction or motive power type or standby power batteries }
- H01M 2/208 ... {for cells or batteries working under specific conditions such as high temperature, gas diffusion, external electrolyte circulation, external supply of reactants }
- H01M 2/22 .. Fixed connections, i.e. not intended for disconnection
- H01M 2/24 ... Intercell connections through partitions, e.g. in a battery case

- H01M 2/26 . . . Electrode connections
- H01M 2/263 {Electrode connections overlying wounded or folded electrode stacks }
- H01M 2/266 {Interconnections of several platelike electrodes in parallel, e.g. electrode pole straps or bridges }
- H01M 2/28 for lead-acid accumulators
- H01M 2/30 . . Terminals
- H01M 2/302 . . . {Terminal post members on carbon electrodes; Machines or processes for applying said terminal post members, e.g. capping of carbon rods }
- H01M 2/305 . . . {Poles or terminals for L.I.S, traction or motive power type or standby power batteries }
- H01M 2/307 {the poles being connected and passing through hollow metallic terminals, e.g. terminal bushings }
- H01M 2/32 . . Methods or arrangements for affording protection against corrosion; Selection of materials therefor
- H01M 2/34 . . with provision for preventing undesired use or discharge, { e.g. complete cut of current (safety devices [H01M 2200/00](#)) }
- H01M 2/341 . . . { Anti-theft provisions }
- H01M 2/342 . . . {Protection against polarity reversal }
- H01M 2/344 . . . {Guarantee labels or covers }
- H01M 2/345 . . . { in response to pressure }
- H01M 2/347 . . . { in response to shock }
- H01M 2/348 . . . { in response to temperature }
- H01M 2/36 . . arrangements for filling, topping-up or emptying cases with or of liquid, e.g. for filling with electrolytes, for washing-out
- H01M 2/361 . . . {Filling of small-sized cells or batteries, e.g. miniature battery or power cells, batteries or cells for portable equipment }
- H01M 2/362 . . . { Filling or topping up of large-sized cells or batteries, e.g. L.I.S. batteries, traction or motive power type or standby power batteries }
- H01M 2/364 . . . {Removing or drainage of electrolyte; Cleaning battery or cell cases }
- H01M 2/365 . . . { means or methods for closing or sealing the liquid supply hole }
- H01M 2/367 . . . { with means for preventing spilling of liquid or electrolyte , e.g. when the battery is tilted or turned over }
- H01M 2/368 . . . { by closing the vent passages with a valve }
- H01M 2/38 . . Arrangements for moving electrolytes
- H01M 2/385 . . . { Electrolyte stirring by action of gases on or in the electrolyte }
- H01M 2/40 . . with external circulating path ([H01M 8/04](#) takes precedence)
- H01M 4/00** **Electrodes** (electrodes for electrolytic processes [C25](#) , { electrodes for hybrid or electric double capacitor [H01G 11/22](#) })
- H01M 4/02 . Electrodes composed of or comprising active material
- H01M 4/04 . . Processes of manufacture in general
- H01M 4/0402 . . . { Methods of deposition of the material }
- H01M 4/0404 { by coating on electrode collectors }

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| H01M 4/0407 | | { by coating on an electrolyte layer } |
| H01M 4/0409 | | { by a doctor blade method, slip-casting or roller coating } |
| H01M 4/0411 | .... | { by extrusion } |
| H01M 4/0414 | .... | { by screen printing } |
| H01M 4/0416 | .... | { involving impregnation with a solution, dispersion, paste or dry powder (H01M 4/0438 takes precedence) } |
| H01M 4/0419 | .... | { involving spraying } |
| H01M 4/0421 | .... | { involving vapour deposition } |
| H01M 4/0423 | ..... | { Physical vapour deposition } |
| H01M 4/0426 | ..... | { Sputtering } |
| H01M 4/0428 | ..... | { Chemical vapour deposition } |
| H01M 4/043 | ... | { involving compressing or compaction } |
| H01M 4/0433 | .... | { Molding } |
| H01M 4/0435 | .... | { Rolling or calendaring } |
| H01M 4/0438 | ... | { by electrochemical processing (electroless electrochemical plating C23C 18/54) } |
| H01M 4/044 | .... | { Activating, forming or electrochemical attack of the supporting material } |
| H01M 4/0442 | ..... | { Anodisation, Oxidation (electrolytic coating by anodisation C25D 9/00) } |
| H01M 4/0445 | ..... | { Forming after manufacture of the electrode, e.g. first charge, cycling } |
| H01M 4/0447 | ..... | { of complete cells or cells stacks } |
| H01M 4/045 | .... | { Electrochemical coating; Electrochemical impregnation } |
| H01M 4/0452 | ..... | { from solutions } |
| H01M 4/0454 | ..... | { from melts } |
| H01M 4/0457 | ..... | { from dispersions or suspensions; Electrophoresis } |
| H01M 4/0459 | .... | { Electrochemical doping, intercalation, occlusion or alloying } |
| H01M 4/0461 | ..... | { Electrochemical alloying } |
| H01M 4/0464 | .... | { Electro organic synthesis } |
| H01M 4/0466 | ..... | { Electrochemical polymerisation } |
| H01M 4/0469 | .... | { Electroforming a self-supporting electrode; Electroforming of powdered electrode material } |
| H01M 4/0471 | ... | { involving thermal treatment, e.g. firing, sintering, backing particulate active material, thermal decomposition, pyrolysis } |
| H01M 4/0473 | ... | { Filling tube-or pockets type electrodes; Applying active mass in cup-shaped terminals } |
| H01M 4/0476 | .... | { with molten material } |
| H01M 4/0478 | .... | { with dispersions, suspensions or pastes } |
| H01M 4/048 | .... | { with dry powder } |
| H01M 4/0483 | ... | { by methods including the handling of a melt (H01M 4/0438 , take precedence) } |
| H01M 4/0485 | .... | { Casting } |
| H01M 4/0488 | .... | { Alloying } |
| H01M 4/049 | ... | { Manufacturing of an active layer by chemical means } |
| H01M 4/0492 | | { Chemical attack of the support material } |
| H01M 4/0495 | | { Chemical alloying } |
| H01M 4/0497 | | { Chemical precipitation } |

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| H01M 4/06 | .. | Electrodes for primary cells |
| H01M 4/08 | ... | Processes of manufacture |
| H01M 4/10 | .... | of pressed electrodes with central core, i.e. dollies |
| H01M 4/12 | .... | of consumable metal or alloy electrodes (use of alloy compositions as active materials H01M 4/38) |
| H01M 4/13 | .. | Electrodes for accumulators with non-aqueous electrolyte, e.g. for lithium-accumulators; Processes of manufacture thereof |

NOTE

This group does not cover electrodes for accumulators working at high temperatures, e.g. molten sodium electrodes, which subject matter is classified in group [H01M 10/39](#)

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| H01M 4/131 | ... | Electrodes based on mixed oxides or hydroxides, or on mixtures of oxides or hydroxides, e.g. LiCoOx |
| H01M 4/1315 | .... | containing halogen atoms, e.g. LiCoOxFy |
| H01M 4/133 | ... | Electrodes based on carbonaceous material, e.g. graphite-intercalation compounds or CFx |
| H01M 4/134 | ... | Electrodes based on metals, Si or alloys |
| H01M 4/136 | ... | Electrodes based on inorganic compounds other than oxides or hydroxides, e.g. sulfides, selenides, tellurides, halogenides or LiCoFy |
| H01M 4/137 | ... | Electrodes based on electro-active polymers |
| H01M 4/139 | ... | Processes of manufacture |
| H01M 4/1391 | .... | of electrodes based on mixed oxides or hydroxides, or on mixtures of oxides or hydroxides, e.g. LiCoOx |
| H01M 4/13915 | ..... | containing halogen atoms, e.g. LiCoOxFy |
| H01M 4/1393 | .... | of electrodes based on carbonaceous material, e.g. graphite-intercalation compounds or CFx |
| H01M 4/1395 | .... | of electrodes based on metals, Si or alloys |
| H01M 4/1397 | .... | of electrodes based on inorganic compounds other than oxides or hydroxides, e.g. sulfides, selenides, tellurides, halogenides or LiCoFy |
| H01M 4/1399 | .... | of electrodes based on electro-active polymers |
| H01M 4/14 | .. | Electrodes for lead-acid accumulators |
| H01M 4/16 | ... | Processes of manufacture |
| H01M 4/18 | .... | of Planté electrodes |
| H01M 4/20 | .... | of pasted electrodes |
| H01M 4/21 | ..... | Drying of pasted electrodes |
| H01M 4/22 | .... | Forming of electrodes |
| H01M 4/23 | ..... | Drying or preserving electrodes after forming |
| H01M 4/24 | .. | Electrodes for alkaline accumulators |
| H01M 4/242 | ... | {Hydrogen storage electrodes } |
| H01M 4/244 | ... | {Zinc electrodes } |
| H01M 4/246 | ... | {Cadmium electrodes } |
| H01M 4/248 | ... | {Iron electrodes } |
| H01M 4/26 | ... | Processes of manufacture |
| H01M 4/28 | | Precipitating active material on the carrier |

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| H01M 4/29 | | by electrochemical methods |
| H01M 4/30 | | Pressing |
| H01M 4/32 | ... | Nickel oxide or hydroxide electrodes |
| H01M 4/34 | ... | Silver oxide or hydroxide electrodes |
| H01M 4/36 | .. | Selection of substances as active materials, active masses, active liquids { (electrode materials of hybrid or double layer capacitors H01G 11/30-H01G 11/50) } |
| H01M 4/362 | ... | { Composites } |
| H01M 4/364 | .... | { as mixtures } |
| H01M 4/366 | .... | { as layered products } |
| H01M 4/368 | ... | { Liquid depolarisers } |
| H01M 4/38 | ... | of elements or alloys |
| H01M 4/381 | .... | { Alkaline or alkaline earth metals elements (H01M 4/40 takes precedence) } |
| H01M 4/382 | ..... | { Lithium (H01M 4/405 takes precedence) } |
| H01M 4/383 | .... | {Hydrogen absorbing alloys } |
| H01M 4/385 | ..... | { of the type LaNi5 } |
| H01M 4/386 | .... | { Silicon or alloys based on silicon } |
| H01M 4/387 | .... | { Tin or alloys based on tin } |
| H01M 4/388 | .... | { Halogens } |
| H01M 4/40 | .... | Alloys based on alkali metals |
| H01M 4/405 | ..... | { Alloys based on lithium } |
| H01M 4/42 | .... | Alloys based on zinc |
| H01M 4/44 | .... | Alloys based on cadmium |
| H01M 4/46 | .... | Alloys based on magnesium or aluminium |
| H01M 4/463 | ..... | { Aluminium based } |
| H01M 4/466 | ..... | { Magnesium based } |
| H01M 4/48 | ... | of inorganic oxides or hydroxides |
| H01M 4/481 | .... | { of mercury } |
| H01M 4/483 | .... | { for non-aqueous cells (H01M 4/485 takes precedence) } |
| H01M 4/485 | .... | of mixed oxides or hydroxides for inserting or intercalating light metals, e.g. LiTi_2O_4 or LiTi_2OxFy (H01M 4/505 , H01M 4/525 take precedence) |
| H01M 4/50 | .... | of manganese |
| H01M 4/502 | ..... | { for non-aqueous cells (H01M 4/505 takes precedence) } |
| H01M 4/505 | ..... | of mixed oxides or hydroxides containing manganese for inserting or intercalating light metals, e.g. LiMn_2O_4 or LiMn_2OxFy |
| H01M 4/52 | .... | of nickel, cobalt or iron |
| H01M 4/521 | ..... | {of iron for aqueous cells } |
| H01M 4/523 | ..... | { for non-aqueous cells (H01M 4/525 takes precedence) } |
| H01M 4/525 | ..... | of mixed oxides or hydroxides containing iron, cobalt or nickel for inserting or intercalating light metals, e.g. LiNiO_2 , LiCoO_2 or LiCoOxFy |
| H01M 4/54 | .... | of silver |
| H01M 4/56 | .... | of lead |
| H01M 4/57 | ..... | of "Grey lead", i.e. powders containing lead and lead oxide |
| H01M 4/58 | ... | of inorganic compounds other than oxides or hydroxides, e.g. sulfides, |

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| | | selenides, tellurides, halogenides or LiCoFy |
| H01M 4/5805 | | { Phosphides } |
| H01M 4/581 | | {Chalcogenides or intercalation compounds thereof } |
| H01M 4/5815 | ..... | { Sulfides } |
| H01M 4/582 | .... | {Halogenides } |
| H01M 4/5825 | .... | { Oxygenated metallic slats or polyanionic structures, e.g. borates, phosphates, silicates, olivines } |

NOTE

Polyanionic structures comprises elements not changing oxidation state during electrochemical reaction, e.g. P, Si, B

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| H01M 4/583 | | Carbonaceous material, e.g. graphite-intercalation compounds or CF _x |
| H01M 4/5835 | ..... | { Comprising fluorine or fluoride salts } |
| H01M 4/587 | ..... | for inserting or intercalating light metals |
| H01M 4/60 | ... | of organic compounds |
| H01M 4/602 | .... | { Polymers } |
| H01M 4/604 | ..... | { containing aliphatic main chain polymers } |
| H01M 4/606 | ..... | { containing aromatic main chain polymers } |
| H01M 4/608 | ..... | { containing heterocyclic rings } |
| H01M 4/62 | .. | Selection of inactive substances as ingredients for active masses, e.g. binders, fillers |
| H01M 4/621 | ... | {Binders } |
| H01M 4/622 | .... | { being polymers } |
| H01M 4/623 | ..... | { fluorinated polymers } |
| H01M 4/624 | ... | {Electric conductive fillers } |
| H01M 4/625 | .... | {Carbon or graphite } |
| H01M 4/626 | .... | { Metals } |
| H01M 4/627 | ... | {Expanders for lead-acid accumulators } |
| H01M 4/628 | ... | { Inhibitors, e.g. gassing inhibitors, corrosion inhibitors } |
| H01M 4/64 | .. | Carriers or collectors { (current collector for hybrid or electric double layer capacitors H01G 11/66) } |
| H01M 4/66 | ... | Selection of materials |
| H01M 4/661 | .... | { Metal or alloys, e.g. alloy coatings (H01M 4/669 take precedence) } |
| H01M 4/662 | ..... | { Alloys (collectors of lead alloys H01M 4/685) } |
| H01M 4/663 | .... | {containing carbon or carbonaceous materials as conductive part, e.g. graphite, carbon fibres } |
| H01M 4/664 | .... | {Ceramic materials } |
| H01M 4/665 | .... | { Composites } |
| H01M 4/666 | ..... | { in the form of mixed materials (H01M 4/668 takes precedence) } |
| H01M 4/667 | ..... | { in the form of layers, e.g. coatings } |
| H01M 4/668 | | {Composites of electroconductive material and synthetic resins } |
| H01M 4/669 | | {Steels } |
| H01M 4/68 | | for use in lead-acid accumulators |

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| H01M 4/685 | | {Lead alloys } |
| H01M 4/70 | ... | characterised by shape or form |
| H01M 4/72 | | Grids |
| H01M 4/73 | ..... | for lead-acid accumulators, e.g. frame plates |
| H01M 4/74 | ..... | Meshes or woven material; Expanded metal |
| H01M 4/742 | ..... | { perforated material } |
| H01M 4/745 | ..... | {Expanded metal } |
| H01M 4/747 | ..... | { Woven material } |
| H01M 4/75 | .... | Wires, rods or strips |
| H01M 4/76 | .... | Containers for holding the active material, e.g. tubes, capsules |
| H01M 4/762 | ..... | {Porous or perforated metallic containers } |
| H01M 4/765 | ..... | {Tubular type or pencil type electrodes; tubular or multitubular sheaths or covers of insulating material for said tubular-type electrodes } |
| H01M 4/767 | ..... | { Multitubular sheaths or covers } |
| H01M 4/78 | .... | Shapes other than plane or cylindrical, e.g. helical |
| H01M 4/80 | .... | Porous plates, e.g. sintered carriers |
| H01M 4/801 | ..... | { Sintered carriers } |
| H01M 4/803 | ..... | { of only powdered material } |
| H01M 4/805 | ..... | { of powdered and fibrous material } |
| H01M 4/806 | ..... | { Nonwoven fibrous fabric containing only fibres } |
| H01M 4/808 | ..... | {Foamed, spongy materials } |
| H01M 4/82 | ... | Multi-step processes for manufacturing carriers for lead-acid accumulators (single step processes see the relevant subclasses, e.g. B21D ; B22D) |
| H01M 4/84 | .... | involving casting |
| H01M 4/86 | . | Inert electrodes with catalytic activity, e.g. for fuel cells |
| H01M 4/8605 | .. | {Porous electrodes } |
| H01M 4/861 | ... | { with a gradient in the porosity } |
| H01M 4/8615 | ... | {Bifunctional electrodes for rechargeable cells } |
| H01M 4/8621 | ... | {containing only metallic or ceramic material, e.g. made by sintering or sputtering } |
| H01M 4/8626 | ... | {characterised by the form } |
| H01M 4/8631 | .... | {Bipolar electrodes } |
| H01M 4/8636 | .. | { with a gradient in another property than porosity (H01M 4/861 takes precedence) } |
| H01M 4/8642 | ... | { Gradient in composition } |
| H01M 4/8647 | .. | { consisting of more than one material, e.g. consisting of composites } |
| H01M 4/8652 | ... | { as mixture } |
| H01M 4/8657 | ... | { layered } |
| H01M 4/8663 | .. | { Selection of inactive substances as ingredients for catalytic active masses, e.g. binders, fillers } |
| H01M 4/8668 | ... | { Binders } |
| H01M 4/8673 | ... | { Electrically conductive fillers } |
| H01M 4/88 | .. | Processes of manufacture |

H01M 4/8803 . . . { Supports for the deposition of the catalytic active composition ([H01M 4/90](#) takes precedence) }

WARNING

Groups [H01M 4/8803](#) to [H01M 4/8896](#) are not complete, pending a reorganization. See also [H01M 4/88](#), [H01M 4/88F](#), [H01M 8/10B2A](#) and [H01M 8/1006](#)

H01M 4/8807 { Gas diffusion layers }

H01M 4/881 { Electrolytic membranes }

H01M 4/8814 { Temporary supports, e.g. decal }

H01M 4/8817 . . . { Treatment of supports before application of the catalytic active composition (coated porous composites [H01M 8/0245](#)) }

H01M 4/8821 { Wet proofing }

H01M 4/8825 . . . { Methods for deposition of the catalytic active composition }

H01M 4/8828 { Coating with slurry or ink }

H01M 4/8832 { Ink jet printing }

H01M 4/8835 { Screen printing }

H01M 4/8839 { Painting }

H01M 4/8842 { Coating using a catalyst salt precursor in solution followed by evaporation and reduction of the precursor }

H01M 4/8846 { Impregnation }

H01M 4/885 { followed by reduction of the catalyst salt precursor }

H01M 4/8853 { Electrodeposition }

H01M 4/8857 { Casting, e.g. tape casting, vacuum slip casting }

H01M 4/886 { Powder spraying, e.g. wet or dry powder spraying, plasma spraying }

H01M 4/8864 { Extrusion }

H01M 4/8867 { Vapour deposition }

H01M 4/8871 { Sputtering }

H01M 4/8875 . . . { Methods for shaping the electrode into free-standing bodies, like sheets, films or grids, e.g. moulding, hot-pressing, casting without support, extrusion without support }

H01M 4/8878 . . . { Treatment steps after deposition of the catalytic active composition or after shaping of the electrode being free-standing body }

H01M 4/8882 { Heat treatment, e.g. drying, baking }

H01M 4/8885 { Sintering or firing }

H01M 4/8889 { Cosintering or cofiring of a catalytic active layer with another type of layer }

H01M 4/8892 { Impregnation or coating of the catalyst layer, e.g. by an ionomer }

H01M 4/8896 { Pressing, rolling, calendering ([membrane electrode assemblies H01M 8/1004](#)) }

H01M 4/90 . . Selection of catalytic material

H01M 4/9008 . . . {Organic or organo-metallic compounds }

H01M 4/9016 . . . {Oxides, hydroxides or oxygenated metallic salts }

H01M 4/9025 { Oxides specially used in fuel cell operating at high temperature, e.g. SOFC }

| | | |
|-------------|-------|---|
| H01M 4/9033 | ..... | { Complex oxides, optionally doped, of the type M_1MeO_3 , M_1 being an alkaline earth metal or a rare earth, Me being a metal, e.g. perovskites } |
| H01M 4/9041 | ... | { Metals or alloys (H01M 4/92 takes precedence) } |
| H01M 4/905 | .... | { specially used in fuel cell operating at high temperature, e.g. SOFC } |
| H01M 4/9058 | ..... | { of noble metals or noble-metal based alloys } |
| H01M 4/9066 | ..... | { of metal-ceramic composites or mixtures, e.g. cermets } |
| H01M 4/9075 | ... | { Catalytic material supported on carriers, e.g. powder carriers (H01M 4/8807 , H01M 4/881 , H01M 4/8814 , H01M 4/925 take precedence) } |
| H01M 4/9083 | .... | { on carbon or graphite } |
| H01M 4/9091 | ... | { Unsupported catalytic particles; loose particulate catalytic materials, e.g. in fluidised state } |
| H01M 4/92 | ... | Metals of platinum group (H01M 4/94 , { H01M 4/9058 } take precedence) |
| H01M 4/921 | .... | { Alloys or mixtures with metallic elements } |
| H01M 4/923 | .... | { Compounds thereof with non-metallic elements } |
| H01M 4/925 | .... | { supported on carriers, e.g. powder carriers } |
| H01M 4/926 | ..... | { on carbon or graphite } |
| H01M 4/928 | .... | { Unsupported catalytic particles; loose particulate catalytic materials, e.g. in fluidised state } |
| H01M 4/94 | .. | Non-porous diffusion electrodes, e.g. palladium membranes, ion exchange membranes |
| H01M 4/96 | .. | Carbon-based electrodes |
| H01M 4/98 | .. | Raney-type electrodes |

H01M 6/00 Primary cells; Manufacture thereof

NOTE

In this group, primary cells are electrochemical generators in which the cell energy is present in chemical form and is not regenerated.

| | | |
|------------|------|--|
| H01M 6/005 | . | { Devices for making primary cells } |
| H01M 6/02 | . | Details (of non-active parts H01M 2/00 ; of electrodes H01M 4/00) |
| H01M 6/04 | . | Cells with aqueous electrolyte |
| H01M 6/045 | .. | { characterised by aqueous electrolyte } |
| H01M 6/06 | .. | Dry cells, i.e. cells wherein the electrolyte is rendered non-fluid |
| H01M 6/08 | ... | with cup shaped electrodes |
| H01M 6/085 | .... | { of the reversed type, i.e. anode in the centre } |
| H01M 6/10 | ... | with wound or folded electrodes |
| H01M 6/103 | .... | { Cells with electrode of only one polarity being folded or wound } |
| H01M 6/12 | ... | with flat electrodes |
| H01M 6/14 | . | Cells with non-aqueous electrolyte (H01M 10/36C takes precedence) |
| H01M 6/145 | .. | { containing ammonia } |
| H01M 6/16 | .. | with organic electrolyte (H01M 6/18 , { H01M 10/40 take precedence }) |

- H01M 6/162 . . . {characterised by the electrolyte }
- H01M 6/164 { by the solvent (organic electrolyte solvents [H01M 2300/0028](#)) }
- H01M 6/166 {by the solute }
- H01M 6/168 {by additives }
- H01M 6/18 . . with solid electrolyte
- H01M 6/181 . . . [N: with polymeric electrolytes (organic polymers electrolytes [H01M 2300/0082](#))
- H01M 6/182 . . . { with halogenide as solid electrolyte (halide solid electrolytes [H01M 2300/008](#)) }
- H01M 6/183 {with fluoride as solid electrolyte }
- H01M 6/185 . . . { with oxides, hydroxides or oxysalts as solid electrolytes (oxides solid electrolyte [H01M 2300/0071](#)) }
- H01M 6/186 { Only oxysalts-containing solid electrolytes }
- H01M 6/187 . . . { Solid electrolyte characterised by the form (layered solid electrolytes [H01M 2300/0094](#)) }
- H01M 6/188 . . . {Processes of manufacture }
- H01M 6/20 . . . working at high temperature (deferred-action thermal cells [H01M 6/36](#))
- H01M 6/22 . Immobilising of electrolyte
- H01M 6/24 . Cells comprising two different electrolytes
- H01M 6/26 . Cells without oxidising active material, e.g. Volta cells
- H01M 6/28 . Standard cells, e.g. Weston cells
- H01M 6/30 . Deferred-action cells
- H01M 6/32 . . activated through external addition of electrolyte or of electrolyte components
- H01M 6/34 . . . Immersion cells, e.g. sea-water cells
- H01M 6/36 . . containing electrolyte and made operational by physical means, e.g. thermal cells (thermoelectric solid state devices [H01L 35/00](#), [H01M 37/00](#))
- H01M 6/38 . . . by mechanical means
- H01M 6/385 { by insertion of electrodes }
- H01M 6/40 . Printed batteries, { e.g. thin film batteries }
- H01M 6/42 . Grouping of primary cells into batteries ([H01M 6/40](#) takes precedence)
- H01M 6/425 . . {Multimode batteries, batteries with "reserve cells" }
- H01M 6/44 . . of tubular or cup-shaped cells
- H01M 6/46 . . of flat cells
- H01M 6/48 . . . with bipolar electrodes
- H01M 6/485 { Side-by-side bipolar batteries }
- H01M 6/50 . Methods or arrangements for servicing or maintenance, e.g. maintaining operating temperature { (cells or batteries combined with safety devices [H01M 2200/00](#)) }
- H01M 6/5005 . . { Auxiliary electrodes }
- H01M 6/5011 . . { for several cells simultaneously or successively }
- H01M 6/5016 . . . { Multimode utilisation }

- H01M 6/5022 . . {Arrangements for moving electrodes or separating elements }
- H01M 6/5027 . . { Dummy cells }
- H01M 6/5033 . . { used as charging means for another battery }
- H01M 6/5038 . . {Heating or cooling of cells or batteries }
- H01M 6/5044 . . {Cells or batteries structurally combined with cell condition indicating means (H01M 2/34 takes precedence) }
- H01M 6/505 . . . { Cells combined with indicating means for externally visualisation of the condition, e.g. by change of colour or of light intensity }
- H01M 6/5055 . . . {End of discharge indicated by a voltage step }
- H01M 6/5061 . . . { cells combined with sound indicating means }
- H01M 6/5066 . . { Type recognition }
- H01M 6/5072 . . { Preserving or storing cells }
- H01M 6/5077 . . {Regeneration of reactants or electrolyte }
- H01M 6/5083 . . {Testing apparatus }
- H01M 6/5088 . . { Initial activation; predischARGE; Stabilisation of initial voltage }
- H01M 6/52 . . Reclaiming serviceable parts of waste cells or batteries, { e.g. recycling }

H01M 8/00 Fuel cells; Manufacture thereof

NOTE

Fuel cells are electrochemical generators wherein the reactants are supplied from outside

- H01M 8/002 . { Shape, form of a fuel cell }
- H01M 8/004 . . { Cylindrical, tubular or wound }
- H01M 8/006 . . { Flat }
- H01M 8/008 . { Destruction or recycling of fuel cells }
- H01M 8/02 . Details
- H01M 8/0202 . . { Collectors, separators, interconnectors, e.g. bipolar separators }
- H01M 8/0204 . . . { Non-porous and characterised by the material }
- H01M 8/0206 {Metals or alloys }
- H01M 8/0208 {Alloys }
- H01M 8/021 {Alloys based on iron }
- H01M 8/0213 {Gas-tight carbon-containing material }
- H01M 8/0215 {Glass or ceramic materials }
- H01M 8/0217 {Complexed oxides, optionally doped, of the type M1MeO₃, M1 being an alkaline earth metal or rare earth metal, Me being a metal, e.g. perovskites }
- H01M 8/0219 {Chromium complex oxides }
- H01M 8/0221 { Polymers or organic resins }
- H01M 8/0223 {Composites }

| | | |
|--------------|-------|---|
| H01M 8/0226 | ..... | { in the form of mixtures } |
| H01M 8/0228 | ..... | { in the form of layered products, e.g. coatings } |
| H01M 8/023 | ... | { Porous and characterised by the material } |
| H01M 8/0232 | .... | { Metals or alloys } |
| H01M 8/0234 | .... | { Carbonaceous material } |
| H01M 8/0236 | .... | { Glass, ceramics or cermets } |
| H01M 8/0239 | .... | { Polymers or organic resins } |
| H01M 8/0241 | .... | { Composites } |
| H01M 8/0243 | ..... | { in the form of mixtures } |
| H01M 8/0245 | ..... | { in the form of layered products, e.g. coatings } |
| H01M 8/0247 | ... | { Porous or non porous and characterised by the form (characterised by a channel configuration H01M 8/0258) } |
| H01M 8/025 | .... | { Semicylindrical } |
| H01M 8/0252 | .... | { Tubular } |
| H01M 8/0254 | .... | { Corrugated or undulate shaped } |
| H01M 8/0256 | .... | { Vias, i.e. connector passing through the separator material } |
| H01M 8/0258 | ... | { Porous or non-porous and characterised by a channel configuration, i.e. by the flow field } |
| H01M 8/026 | .... | { Grooves characteristics, pitch, depth } |
| H01M 8/0263 | .... | { Meander or serpentine path } |
| H01M 8/0265 | .... | { Variable section of reactant channel } |
| H01M 8/0267 | ... | { Heating or cooling facilities in the separators, collectors or interconnectors } |
| H01M 8/0269 | ... | { Separators, collectors or interconnectors including a printed circuit board } |
| H01M 8/0271 | .. | { of surrounding electrodes, matrices, membranes or fuel cell elements with sealing or supporting material } |
| H01M 8/0273 | ... | { in the form of a frame; Frame materials; Way of attaching to frames } |
| H01M 8/0276 | ... | { Seals characterised by their form } |
| H01M 8/0278 | .... | { O-rings } |
| H01M 8/028 | ... | { Seals characterised by their composition } |
| H01M 8/0282 | .... | { Inorganic material } |
| H01M 8/0284 | .... | { Organic resins or polymers } |
| H01M 8/0286 | ... | { Process of seal formation } |
| H01M 8/0289 | .. | { of membranes or electrolyte holding means } |
| H01M 8/0291 | ... | { Matrices; Diaphragms; Membranes } |
| H01M 8/0293 | .... | { for immobilising electrolyte solutions } |
| H01M 8/0295 | .... | { for immobilising electrolyte melts } |
| H01M 8/0297 | .. | { of joining electrodes, reservoir layers, heat exchange units or bipolar separators to each other } |
| H01M 8/04 | . | Auxiliary arrangements or processes, e.g. for control of pressure, for circulation of fluids |
| H01M 8/04007 | .. | { Arrangements or means or processes related to heat exchange or temperature measurements (methods for controlling fuel cells or fuel cell systems H01M 8/04298) } |
| H01M 8/04014 | ... | { by a gaseous fluid or by combustion of reactants, e.g. bigascooling } |

| | | |
|--------------|-------|---|
| H01M 8/04022 | .... | {Heating by combustion } |
| H01M 8/04029 | ... | {by a liquid fluid } |
| H01M 8/04037 | ... | { Electrical heating } |
| H01M 8/04044 | ... | { Coolant purification } |
| H01M 8/04052 | ... | { Storage of heat in the fuel cell system } |
| H01M 8/04059 | ... | { Evaporative processes for the cooling of a fuel cell } |
| H01M 8/04067 | ... | { Heat exchange or temperature measuring elements, thermal insulation, e.g. heat pipes, heat pumps, fins } |
| H01M 8/04074 | .... | { Heat exchange unit structures specially adapted for fuel cell (heat exchanger F28 , heat exchangers for fuel cells F28D 2021/0043) } |
| H01M 8/04082 | .. | { Arrangements or means for reactant regulation. E.g. pressure or concentration } |
| H01M 8/04089 | ... | {of gaseous reactants } |
| H01M 8/04097 | .... | {with recycling of the reactants (H01M 8/04119 , H01M 8/04104 take precedence) } |
| H01M 8/04104 | .... | {Regulation of differential pressures } |
| H01M 8/04111 | .... | { Using a compressor turbine assembly } |
| H01M 8/04119 | .... | {with simultaneous supply or evacuation of electrolyte; Humidifying or dehumidifying } |
| H01M 8/04126 | ..... | { Humidifying } |
| H01M 8/04134 | ..... | { by coolants } |
| H01M 8/04141 | ..... | { by water containing exhaust gases } |
| H01M 8/04149 | ..... | { by diffusion, e.g. making use of membranes } |
| H01M 8/04156 | ..... | {with product water removal } |
| H01M 8/04164 | ..... | { by condensers, gas-liquid separators or filters } |
| H01M 8/04171 | ..... | { using adsorbents, wicks or hydrophilic material } |
| H01M 8/04179 | ..... | { by purging or increasing flow or pressure of reactants } |
| H01M 8/04186 | ... | {of liquid- or electrolyte-charged reactants } |
| H01M 8/04194 | .... | { Concentration measuring cells } |
| H01M 8/04201 | ... | { Reactant storage and supply, e.g. means for feeding, pipes } |
| H01M 8/04208 | .... | { Cartridges, cryogenic media or cryogenic reservoirs } |
| H01M 8/04216 | .... | { characterised by the choice for a specific material, e.g. carbon, hydride, absorbent } |
| H01M 8/04223 | ... | { Arrangements or means particularly during start-up or shut-down; Depolarisation or activation treatment, e.g. purging; Short-circuiting means for defective fuel cells } |
| H01M 8/04231 | .... | { Purging of the reactants } |
| H01M 8/04238 | .... | { Depolarisation } |
| H01M 8/04246 | .... | { Short circuiting means for defective fuel cells (detection of defective fuel cells H01M 8/04664 , methods for shunting fuel cells H01M 8/04955) } |
| H01M 8/04253 | .... | { Means for solving freezing problems } |
| H01M 8/04261 | .... | { Preventing means for fuel crossover } |
| H01M 8/04268 | .... | { Heating of fuel cells during the start-up of the fuel cells } |
| H01M 8/04276 | .. | { Arrangements or means related to the management of the electrolyte stream, e.g. heat exchange (H01M 8/04119 takes precedence; Treatment of electrolyte residue H01M 8/0693) } |

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|--------------|-------|--|
| H01M 8/04283 | ... | { Supply means of electrolyte to or in matrix-fuel cells } |
| H01M 8/04291 | .. | {Electrolyte- or water-management of solid electrolyte cells (H01M 8/04119 takes precedence) } |
| H01M 8/04298 | .. | { Methods for controlling fuel cells or fuel cell systems (means for control H01M 8/04007 to H01M 8/04291) } |
| H01M 8/04305 | ... | { Modelling, demonstration models of fuel cells, e.g. for training purposes } |
| H01M 8/04313 | ... | { characterised by variables to be detected or calculated, failure or abnormal functionality of the system } |
| H01M 8/0432 | .... | { Temperature including ambient temperature } |
| H01M 8/04328 | ..... | { of anode reactants at the inlet or inside the fuel cell } |
| H01M 8/04335 | ..... | { of cathode reactants at the inlet or inside the fuel cell } |
| H01M 8/04343 | ..... | { of anode exhausts } |
| H01M 8/0435 | ..... | { of cathode exhausts } |
| H01M 8/04358 | ..... | { of the coolant } |
| H01M 8/04365 | ..... | { of other components of a fuel cell or fuel cell stacks } |
| H01M 8/04373 | ..... | { of auxiliary devices, e.g. reformers, compressors, burners } |
| H01M 8/0438 | .... | { Pressure or flow including ambient pressure } |
| H01M 8/04388 | ..... | { of anode reactants at the inlet or inside the fuel cell } |
| H01M 8/04395 | ..... | { of cathode reactants at the inlet or inside the fuel cell } |
| H01M 8/04402 | ..... | { of anode exhausts } |
| H01M 8/0441 | ..... | { of cathode exhausts } |
| H01M 8/04417 | ..... | { of the coolant } |
| H01M 8/04425 | ..... | { at auxiliary devices, e.g. reformers, compressors, burners } |
| H01M 8/04432 | ..... | { Pressure differences, e.g. between anode and cathode } |
| H01M 8/0444 | .... | { Concentrations or densities } |
| H01M 8/04447 | ..... | { of anode reactants at the inlet or inside the fuel cell } |
| H01M 8/04455 | ..... | { of cathode reactants at the inlet or inside the fuel cell } |
| H01M 8/04462 | ..... | { of anode exhausts } |
| H01M 8/0447 | ..... | { of cathode exhausts } |
| H01M 8/04477 | ..... | { of the electrolyte } |
| H01M 8/04485 | ..... | { of the coolant } |
| H01M 8/04492 | .... | { Humidity, moisture or water content including ambient humidity } |
| H01M 8/045 | ..... | { of anode reactants at the inlet or inside the fuel cell } |
| H01M 8/04507 | ..... | { of cathode reactants at the inlet or inside the fuel cell } |
| H01M 8/04514 | ..... | { of anode exhausts } |
| H01M 8/04522 | ..... | { of cathode exhausts } |
| H01M 8/04529 | ..... | { of the electrolyte } |
| H01M 8/04537 | .... | { Electric variables } |
| H01M 8/04544 | ..... | { Voltage } |
| H01M 8/04552 | ..... | { of the individual fuel cell } |
| H01M 8/04559 | ..... | { of fuel cell stacks } |
| H01M 8/04567 | ..... | { of auxiliary devices, e.g. batteries, capacitors } |
| H01M 8/04574 | ..... | { Current } |

| | | |
|--------------|-------|---|
| H01M 8/04582 | ..... | { of the individual fuel cell } |
| H01M 8/04589 | ..... | { of fuel cell stacks } |
| H01M 8/04597 | ..... | { of auxiliary devices, e.g. batteries, capacitors } |
| H01M 8/04604 | ..... | { Power, energy, capacity or load } |
| H01M 8/04611 | ..... | { of the individual fuel cell } |
| H01M 8/04619 | ..... | { of fuel cell stacks } |
| H01M 8/04626 | ..... | { of auxiliary devices, e.g. batteries, capacitors } |
| H01M 8/04634 | ..... | { Other electric variables, e.g. resistance or impedance } |
| H01M 8/04641 | ..... | { of the individual fuel cell } |
| H01M 8/04649 | ..... | { of fuel cell stacks } |
| H01M 8/04656 | ..... | { of auxiliary devices, e.g. batteries, capacitors } |
| H01M 8/04664 | .... | { Failure or abnormal functionality } |
| H01M 8/04671 | ..... | { of the individual fuel cell } |
| H01M 8/04679 | ..... | { of fuel cell stacks } |
| H01M 8/04686 | ..... | { of auxiliary devices, e.g. batteries, capacitors } |
| H01M 8/04694 | ... | { characterised by variables to be regulated } |
| H01M 8/04701 | .... | { Temperature } |
| H01M 8/04708 | ..... | { of fuel cell reactants } |
| H01M 8/04716 | ..... | { of fuel cell exhausts } |
| H01M 8/04723 | ..... | { of the coolant } |
| H01M 8/04731 | ..... | { of other components of a fuel cell or fuel cell stacks } |
| H01M 8/04738 | ..... | { of auxiliary devices, e.g. reformer, compressor, burner } |
| H01M 8/04746 | .... | { Pressure or flow } |
| H01M 8/04753 | ..... | { of fuel cell reactants } |
| H01M 8/04761 | ..... | { of fuel cell exhausts } |
| H01M 8/04768 | ..... | { of the coolant } |
| H01M 8/04776 | ..... | { at auxiliary devices, e.g. reformer, compressor, burner } |
| H01M 8/04783 | ..... | { Pressure differences, e.g. between anode and cathode } |
| H01M 8/04791 | .... | { Concentrations or densities } |
| H01M 8/04798 | ..... | { of fuel cell reactants } |
| H01M 8/04805 | ..... | { of fuel cell exhausts } |
| H01M 8/04813 | ..... | { of the coolant } |
| H01M 8/0482 | ..... | { of the electrolyte } |
| H01M 8/04828 | .... | { Humidity, moisture or water content } |
| H01M 8/04835 | ..... | { of fuel cell reactants } |
| H01M 8/04843 | ..... | { of fuel cell exhausts } |
| H01M 8/0485 | ..... | { of the electrolyte } |
| H01M 8/04858 | .... | { Electric variables } |
| H01M 8/04865 | ..... | { Voltage } |
| H01M 8/04873 | ..... | { of the individual fuel cell } |
| H01M 8/0488 | ..... | { of fuel cell stacks } |
| H01M 8/04888 | ..... | { of auxiliary devices, e.g. batteries, capacitors } |

| | | |
|--------------|-------|--|
| H01M 8/04895 | ..... | { Current } |
| H01M 8/04902 | ..... | { of the individual fuel cell } |
| H01M 8/0491 | ..... | { of fuel cell stacks } |
| H01M 8/04917 | ..... | { of auxiliary devices, e.g. batteries, capacitors } |
| H01M 8/04925 | ..... | { Power, energy, capacity or load } |
| H01M 8/04932 | ..... | { of the individual fuel cell } |
| H01M 8/0494 | ..... | { of fuel cell stacks } |
| H01M 8/04947 | ..... | { of auxiliary devices, e.g. batteries, capacitors } |
| H01M 8/04955 | ..... | { Turning on/off, shunting of fuel cells or fuel cell system components (arrangements or means during start-up or shut-down H01M 8/04223) } |
| H01M 8/04962 | ..... | { Other electric variables e.g. resistance or impedance } |
| H01M 8/0497 | ..... | { of the individual fuel cell } |
| H01M 8/04977 | ..... | { of fuel cell stacks } |
| H01M 8/04985 | ..... | { of auxiliary devices, e.g. batteries, capacitors } |
| H01M 8/04992 | ... | { characterised by the implementation of the control method by mathematical or computational algorithm, e.g. control feedback loop mechanisms, fuzzy logic, neural networks, artificial intelligence } |
| H01M 8/06 | . | Combination of fuel cell with means for production of reactants or for treatment of residues |
| H01M 8/0606 | .. | {Producing gaseous reactants } |
| H01M 8/0612 | ... | {from carbon containing material } |
| H01M 8/0618 | .... | { Reforming processes, e.g. autothermal, partial oxidation or steam reforming } |
| H01M 8/0625 | .... | {in a modular combined reactor/fuel cell structure } |
| H01M 8/0631 | ..... | { Reactor construction specially adapted for combination reactor/fuel cell (Hydrogen C01B 3/00 , reactors for physicochemical processes B01J 19/00) } |
| H01M 8/0637 | .... | { Direct internal reforming at the anode of the fuel cell } |
| H01M 8/0643 | .... | {Gasification of solid fuel } |
| H01M 8/065 | ... | { by dissolution of metals or alloys or by dehydrating metallic substance } |
| H01M 8/0656 | ... | {by electrochemical means (H01M 8/065 takes precedence) } |
| H01M 8/0662 | .. | {Treatment of gaseous reactants or gaseous residues, e.g. cleaning (humidifying or dehumidifying of gaseous reactants H01M 8/04119) } |
| H01M 8/0668 | ... | { Removal of carbon monoxide or carbon dioxide } |
| H01M 8/0675 | ... | { Removal of sulfur } |
| H01M 8/0681 | ... | { Reactant purification by the use of electrochemical cells } |
| H01M 8/0687 | ... | { Reactant purification by the use of membranes or filters } |
| H01M 8/0693 | .. | {Treatment of the electrolyte residue, e.g. reconcentrating } |
| H01M 8/08 | . | Fuel cells with aqueous electrolytes |
| H01M 8/083 | .. | { Alkaline fuel cells } |
| H01M 8/086 | .. | { Phosphoric acid fuel cells (PAFC) } |
| H01M 8/10 | . | Fuel cells with solid electrolytes |

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| H01M 8/1002 | .. | {with anode and cathode gas-diffusion electrodes or electrode layers, e.g. using gaseous or vaporised reactants (H01M 8/12 takes precedence) } |
| H01M 8/1004 | ... | { characterised by the electrode/electrolyte combination } |
| H01M 8/1006 | .... | { Undulated, corrugated, curved or wave-shaped membrane-electrode-assemblies (MEA) } |
| H01M 8/1009 | .. | {with one of the reactants being liquid, solid or liquid-charged (H01M 8/12 takes precedence) } |
| H01M 8/1011 | ... | { Direct methanol fuel cells (DMFC) } |
| H01M 8/1013 | ... | { Other direct alcohol fuel cells (DAFC) } |
| H01M 8/1016 | .. | {characterised by the electrolyte material (H01M 8/12 takes precedence) } |
| H01M 8/1018 | ... | {Polymeric electrolyte material } |
| H01M 8/102 | .... | { characterised by the chemical structure of the main chain of the ion conducting polymer (membrane support H01M 8/1058 , semi-permeable membrane composition B01D 71/00 , ion-exchange membrane C08J 5/22) } |

NOTE

Multiple classification is done when two or more heteroatoms from O, P, N, S, Si are present

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| H01M 8/1023 | | { having only carbon, e.g. Nafion, vinylsulfonic acid, polyarylenes, polystyrenes, polybutadiene-styrene } |
| H01M 8/1025 | ..... | { having only carbon and oxygen, e.g. polyethers, sulfonated-polyetheretherketones [s-PEEK], sulfonated-polysaccharides, sulfonated-celluloses, sulfonated-polyesters] |
| H01M 8/1027 | ..... | { having carbon, oxygen and other atoms, e.g. sulfonated-polyethersulfones [s-PES], sulfonated-polyphenyl-quinoxaline [s-PPQ] } |
| H01M 8/103 | ..... | { having nitrogen, e.g. sulfonated-polybenzimidazoles [s-PBI], polybenzimidazoles with phosphoric acid, sulfonated-polyamides [s-PA], sulfonated polyphosphazenes [s-PPh] |
| H01M 8/1032 | ..... | { having sulfur, e.g. sulfonated polyphosphazene [s-PPh] } |
| H01M 8/1034 | ..... | { having phosphorous , e.g. sulfonated polyphosphazene [s-PPh] } |
| H01M 8/1037 | ..... | { having silicon, e.g. sulfonated crosslinked polydimethylsiloxane } |
| H01M 8/1039 | .... | { being halogenated ,e.g. Nafion, sulfonated polyvinylidene fluoride } |
| H01M 8/1041 | .... | { Polymer electrolyte composites, mixtures or blends other than copolymers or grafted polymers } |
| H01M 8/1044 | ..... | { Mixtures of polymers with at least one polymer being ionically conductive } |
| H01M 8/1046 | ..... | { Mixtures of polymer and additives } |
| H01M 8/1048 | ..... | { Ion conductive additives, e.g. polybenzimidazole with phosphoric acid, ion conducting particles, heteropolyacids or metal phosphate } |
| H01M 8/1051 | ..... | { Non ion conductive additives, e.g. stabilizers, SiO ₂ , ZrO ₂ } |
| H01M 8/1053 | ..... | { Layers of polymers with at least one layer being ionically conductive } |
| H01M 8/1055 | ..... | { Inorganic layers on the polymer electrolytes, e.g. inorganic coatings } |
| H01M 8/1058 | | { characterized by a porous support having no ionic conductive properties (membrane immobilizing electrolyte solutions or melts H01M 8/0293 , H01M 8/0295) } |
| H01M 8/106 | | { Chemical composition of the porous support } |

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|-------------|-------|---|
| H01M 8/1062 | | { Physical properties of the porous support, e.g. porosity, thickness } |
| H01M 8/1065 | .... | { characterized by their form, e.g. perforated, undulated (semi-permeable membranes characterised by their form B01D 69/00) } |
| H01M 8/1067 | .... | { characterized by their physical properties, e.g. porosity, ionic conductivity, thickness } |
| H01M 8/1069 | .... | { characterized by the manufacturing processes (semi-permeable membrane manufacturing processes B01D 67/00 ; manufacture of ion-exchange membrane C08J 5/22) } |
| H01M 8/1072 | ..... | { Chemical reactions, e.g. in-situ polymerisation, in-situ crosslinking } |
| H01M 8/1074 | ..... | { Sol-gel processes } |
| H01M 8/1076 | ..... | { Micromachining techniques, e.g. masking, etching steps, photolithography } |
| H01M 8/1079 | ..... | { Inducing porosity into non porous precursors membranes, e.g. leaching, pore stretching } |
| H01M 8/1081 | ..... | { Starting from polymer solutions, dispersions, slurries other than monomer solutions, dispersions, slurries } |
| H01M 8/1083 | ..... | { Starting from polymer melts other than monomer melts } |
| H01M 8/1086 | ..... | { After-treatment of the membrane other than polymerisation } |
| H01M 8/1088 | ..... | { chemical modification, e.g. sulfonation } |
| H01M 8/109 | ..... | { thermal other than drying, e.g. sintering } |
| H01M 8/1093 | ..... | { mechanical, e.g. pressing, puncturing } |
| H01M 8/1097 | .. | { Fuel cells applied on a support, e.g. miniature fuel cell deposited on a silica support } |
| H01M 8/12 | .. | operating at high temperature, e.g. with stabilised ZrO ₂ electrolyte |
| H01M 8/1206 | ... | {with the anode and the cathode in the form of gas diffusion electrodes } |
| H01M 8/1213 | .... | {characterised by the electrodes, the electrode/electrolyte combination or the supporting material } |
| H01M 8/122 | ..... | { Undulated, corrugated, curved or wave-shaped membrane electrode assemblies (MEA) } |
| H01M 8/1226 | ..... | {Supporting layer characteristics } |
| H01M 8/1233 | ... | {one of the reactants being solid or liquid } |
| H01M 8/124 | ... | {characterised by the process of manufacturing or by the material of the electrolyte } |
| H01M 8/1246 | .... | { the electrolyte consisting of oxides (solid oxides ion conductive electrolyte H01M 2300/0074) } |
| H01M 8/1253 | ..... | { the electrolyte containing zirconium oxide (solid electrolyte based on zirconium oxide H01M 2300/0077) } |
| H01M 8/126 | ..... | {the electrolyte containing cerium oxide } |
| H01M 8/1266 | ..... | {the electrolyte containing bismuth oxide } |
| H01M 8/1273 | ..... | { Fuel cells with solid halide electrolytes (solid halide electrolyte H01M 2300/008) } |
| H01M 8/1286 | ... | { Fuel cells applied on a support, e.g. miniature fuel cells deposited on a silica support } |
| H01M 8/14 | . | Fuel cells with fused electrolytes |
| H01M 8/141 | .. | {the anode and the cathode being gas-permeable electrodes or electrode layers } |
| H01M 8/142 | ... | {with matrix-supported or semi-solid matrix-reinforced electrolyte } |

- H01M 8/143 .. {with liquid, solid or electrolyte-charged reactants }
- H01M 8/144 .. {characterised by the electrolyte material }
- H01M 8/145 ... {comprising carbonates }
- H01M 8/146 .. { Fuel cells with molten hydroxide (molten hydroxide electrolyte T01M300/B6H) }
- H01M 8/148 .. {Measures, other than selecting a specific electrode material, to reduce electrode dissolution }

- H01M 8/16 . Biochemical fuel cells, i.e. cells in which micro-organisms function as catalysts

- H01M 8/18 . Regenerative fuel cells
- H01M 8/182 .. {Regeneration by thermal means }
- H01M 8/184 .. {Regeneration by electrochemical means }
- H01M 8/186 ... {by electrolytic decomposition of the electrolytic solution or the formed water product }
- H01M 8/188 ... {by recharging of redox couples containing fluids; Redox flow type batteries }

- H01M 8/20 . Indirect fuel cells, e.g. Redox cells ([H01M 8/18 takes precedence](#))

- H01M 8/22 . Fuel cells in which the fuel is based on materials comprising carbon or oxygen or hydrogen and other elements; Fuel cells in which the fuel is based on materials comprising only elements other than carbon, oxygen or hydrogen
- H01M 8/222 .. {Fuel cells in which the fuel is based on compounds containing nitrogen, e.g. hydrazine, ammonia }
- H01M 8/225 .. {Fuel cells in which the fuel is based on materials comprising particulate active material in the form of a suspension, a dispersion, a fluidised bed or a paste }
- H01M 8/227 .. {Dialytic cells or batteries; Reverse electrodialysis cells or batteries }

- H01M 8/24 . Grouping of fuel cells into batteries
- H01M 8/2405 .. {comprising spaced diffusion electrodes or electrode layers with interposed electrolyte layer or electrolyte compartment }
- H01M 8/241 ... {with solid or matrix-supported electrolyte }
- H01M 8/2415 {External manifolded battery stock ([H01M 8/2425](#), [H01M 8/244 take precedence](#)) }
- H01M 8/242 {comprising framed electrodes or intermediary frame-like gaskets ([H01M 8/2425](#), [H01M 8/244 take precedence](#)) }
- H01M 8/2425 {High-temperature cells with solid electrolyte }
- H01M 8/243 {of tubular or cylindrical configuration }
- H01M 8/2435 {with monolithic core structure, e.g. honeycombs }
- H01M 8/244 {with matrix-supported molten electrolyte }
- H01M 8/2445 ... {comprising spaced diffusion electrodes or electrode layers with interposed electrolyte compartment with possible electrolyte supply or circulation }
- H01M 8/245 {comprising framed electrodes or intermediary frame-like gaskets }
- H01M 8/2455 .. {with liquid, solid or electrolyte-charged reactants }
- H01M 8/246 ... {with framed electrodes or intermediary frame-like gaskets }
- H01M 8/2465 .. {Details of fuel cell stacks }
- H01M 8/247 ... { Arrangements for tightening a stack, for accommodation of a stack in a tank, for assembling different tanks }

- H01M 8/2475 { Enclosures, casings or containers of fuel cells }
- H01M 8/248 { Compression means of the fuel cell stack }
- H01M 8/2485 . . . {Arrangements for sealing or mounting external manifolds around a stack;
Manifold structure and material }
- H01M 8/249 . . {comprising a plurality of stacks, e.g. modular assembly }
- H01M 8/2495 . . . {of fuel cells of different type }

H01M 10/00 Secondary cells; Manufacture thereof

NOTE

Secondary cells are accumulators receiving and supplying electrical energy by means of reversible electrochemical reactions.

- H01M 10/02 . Details (of non-active parts [H01M 2/00](#); of electrodes [H01M 4/00](#))
- H01M 10/04 . Construction or manufacture in general ([H01M 10/12](#), [H01M 10/28](#), [H01M 10/38](#) take precedence)
- H01M 10/0404 . . { Machines for assembling batteries }
- H01M 10/0409 . . . { for cells with wound electrodes }
- H01M 10/0413 . . { Large-sized flat cells or batteries for motive or stationary systems with plate-like electrodes }
- H01M 10/0418 . . . {with bipolar electrodes }
- H01M 10/0422 . . { Cells or battery with cylindrical casing }
- H01M 10/0427 . . . {Button cells }
- H01M 10/0431 . . { Cells with wound or folded electrodes ([H01M 10/045](#) takes precedence) }
- H01M 10/0436 . . { Small-sized flat cells or batteries portable equipment }
- H01M 10/044 . . . {with bipolar electrodes }
- H01M 10/0445 . . { Multimode batteries, e.g. containing auxiliary cells or electrodes switchable in parallel or series connections }
- H01M 10/045 . . { Cells or batteries with folded plate-like electrodes }
- H01M 10/0454 . . . { Cells or batteries with electrodes of only one polarity folded }
- H01M 10/0459 . . { Cells or batteries with folded separator between plate-like electrodes }
- H01M 10/0463 . . { Cells or batteries with horizontal or inclined electrodes }
- H01M 10/0468 . . { Compression means for stacks of electrodes and separators }
- H01M 10/0472 . . { Vertically superposed cells with vertically disposed plates }
- H01M 10/0477 . . { with circular plates }
- H01M 10/0481 . . { Compression means other than compression means for stacks of electrodes and separators }
- H01M 10/0486 . . { Frames for plates or membranes }
- H01M 10/049 . . {Processes for forming or storing electrodes in the battery container }
- H01M 10/05 . Accumulators with non-aqueous electrolyte ([H01M 10/39](#) takes precedence)
- H01M 10/052 . . Li-accumulators
- H01M 10/0525 . . . Rocking-chair batteries, i.e. batteries with lithium insertion or intercalation in both electrodes; Lithium-ion batteries

- H01M 10/054 . . Accumulators with insertion or intercalation of metals other than lithium, e.g. with magnesium or aluminium
- H01M 10/056 . . characterised by the materials used as electrolytes, e.g. mixed inorganic/organic electrolytes { (electrolytes for hybrid or electric double layer capacitors [H01G 11/54](#)) }
- H01M 10/0561 . . . the electrolyte being constituted of inorganic materials only
- H01M 10/0562 Solid materials
- H01M 10/0563 Liquid materials, e.g. for Li-SOCl₂ cells
- H01M 10/0564 . . the electrolyte being constituted of organic materials only
- H01M 10/0565 Polymeric materials, e.g. gel-type or solid-type
- H01M 10/0566 Liquid materials
- H01M 10/0567 characterised by the additives
- H01M 10/0568 characterised by the solutes
- H01M 10/0569 characterised by the solvents
- H01M 10/058 . . Construction or manufacture
- H01M 10/0583 . . . of accumulators with folded construction elements except wound ones, i.e. folded positive or negative electrodes or separators, e.g. with "Z"-shaped electrodes or separators
- H01M 10/0585 . . . of accumulators having only flat construction elements, i.e. flat positive electrodes, flat negative electrodes and flat separators
- H01M 10/0587 . . . of accumulators having only wound construction elements, i.e. wound positive electrodes, wound negative electrodes and wound separators

- H01M 10/06 . Lead-acid accumulators (semi-lead accumulators [H01M 10/20](#))
- H01M 10/08 . . Selection of materials as electrolytes
- H01M 10/10 . . . Immobilising of electrolyte
- H01M 10/12 . . Construction or manufacture
- H01M 10/121 . . . { Valve regulated lead acid batteries [VRLA] }
- H01M 10/122 . . . {Multimode batteries }
- H01M 10/123 . . . { Cells or batteries with cylindrical casing }
- H01M 10/124 {Button cells }
- H01M 10/125 . . . {Cells or batteries with wound or folded electrodes }
- H01M 10/126 . . . {Small-sized flat cells or batteries for portable equipment ([H01M 10/123](#) and [H01M 10/125](#) take precedence) }
- H01M 10/127 {with bipolar electrodes }
- H01M 10/128 . . . {Processes for forming or storing electrodes in the battery container }
- H01M 10/14 . . . Assembling a group of electrodes or separators
- H01M 10/16 . . . Suspending or supporting electrodes or groups of electrodes in the case
- H01M 10/18 . . with bipolar electrodes

- H01M 10/20 . Semi-lead accumulators, i.e. accumulators in which only one electrode contains lead
- H01M 10/22 . . Selection of materials as electrolytes

- H01M 10/24 . Alkaline accumulators
- H01M 10/26 . . Selection of materials as electrolytes
- H01M 10/28 . . Construction or manufacture

- H01M 10/281 ... {Large cells or batteries with stacks of plate-like electrodes }
- H01M 10/282 {with bipolar electrodes }
- H01M 10/283 ... {Cells or batteries with two cup-shaped or cylindrical collectors ([H01M 10/281](#) takes precedence) }
- H01M 10/285 {Button cells }
- H01M 10/286 ... {Cells or batteries with wound or folded electrodes }
- H01M 10/287 ... {Small-sized flat cells or batteries for portable equipment ([H01M 10/283](#) and [H01M 10/286](#) take precedence) }
- H01M 10/288 ... {Processes for forming or storing electrodes in the battery container }
- H01M 10/30 .. Nickel accumulators ([H01M 10/34](#) takes precedence)
- H01M 10/32 .. Silver accumulators ([H01M 10/34](#) takes precedence)
- H01M 10/34 . Gastight accumulators
- H01M 10/342 .. { Gastight lead accumulators ([H01M 10/121](#) takes precedence) }
- H01M 10/345 .. { Gastight metal hydride accumulators }
- H01M 10/347 ... {with solid electrolyte }
- H01M 10/36 . Accumulators not provided for in groups [H01M 10/05-H01M 10/34](#)
- H01M 10/365 .. {Zinc-halogen accumulators }
- H01M 10/38 .. Construction or manufacture
- H01M 10/39 .. Working at high temperature
- H01M 10/3909 ... { Sodium-sulfur cells }
- H01M 10/3918 { characterised by the electrolyte }
- H01M 10/3927 { Several layers of electrolyte or coatings containing electrolyte }
- H01M 10/3936 { Electrolyte with a shape other than plane or cylindrical }
- H01M 10/3945 { containing additives or special arrangements in the sodium compartment }
- H01M 10/3954 { containing additives or special arrangement in the sulfur compartment }
- H01M 10/3963 { Sealing means between the solid electrolyte and holders }
- H01M 10/3972 { Flexible parts }
- H01M 10/3981 { Flat cells }
- H01M 10/399 ... { Cells with molten salts }
- H01M 10/42 . Methods or arrangements for servicing or maintenance of secondary cells or secondary half-cells
- H01M 10/4207 .. {for several batteries or cells simultaneously or sequentially }
- H01M 10/4214 .. {Arrangements for moving electrodes or electrolyte }
- H01M 10/4221 .. { with battery type recognition }
- H01M 10/4228 .. { Leak testing of cells or batteries }
- H01M 10/4235 .. {Safety or regulating additives or arrangements in electrodes, separators or electrolyte ([H01M 10/4242](#) takes precedence) }
- H01M 10/4242 .. {Regeneration of electrolyte or reactants }
- H01M 10/425 .. { Structural combination with electronic components, e.g. electronic circuits integrated to the outside of the casing ([printed circuits H05K 1/00](#)) }
- H01M 10/4257 ... { Smart batteries, e.g. electronic circuits inside the housing of the cells or batteries }

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| H01M 10/4264 | ... | { with capacitors } |
| H01M 10/4285 | .. | { Testing apparatus } |
| H01M 10/44 | .. | Methods for charging or discharging (circuits for charging H02J 7/00) |
| H01M 10/441 | ... | { for several batteries or cells simultaneously or sequentially } |
| H01M 10/443 | ... | { in response to temperature } |
| H01M 10/445 | ... | { in response to gas pressure } |
| H01M 10/446 | ... | { Initial charging measures } |
| H01M 10/448 | ... | { End of discharge regulating measures } |
| H01M 10/46 | .. | Accumulators structurally combined with charging apparatus (circuits for charging H02J 7/00) |
| H01M 10/465 | ... | { with solar battery as charging system } |
| H01M 10/48 | .. | Accumulators combined with arrangements for measuring, testing or indicating condition, e.g. level or density of the electrolyte ({ H01M 10/44 takes precedence }; indicating or measuring level of liquid in general G01F 23/00 ; measuring density G01N , e.g. G01N 9/00 ; measuring electric variables G01R) |
| H01M 10/482 | ... | { for several batteries or cells simultaneously or sequentially } |
| H01M 10/484 | ... | { for measuring electrolyte level, electrolyte density or electrolyte conductivity } |
| H01M 10/486 | ... | { for measuring temperature } |
| H01M 10/488 | ... | { Cells or batteries combined with indicating means for externally visualisation of the condition, e.g. by change of colour or of light intensity } |
| H01M 10/50 | .. | Heating or cooling or regulating temperature (control of temperature in general G05D 23/00) |
| H01M 10/5002 | ... | { Types of temperature regulation } |

WARNING

Groups [H01M 10/5002](#) to [H01M 10/5097](#) are not complete, pending reclassification. See also [H01M 10/50](#), [H01M 10/50B](#), [T01M 6/50S2-T01M 6/50S2R](#)

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| H01M 10/5004 | | { Cooling or keeping cold } |
| H01M 10/5006 | | { Heating or keeping warm } |
| H01M 10/5008 | | { Uniformity or distribution of temperature in space } |
| H01M 10/501 | ... | { specially adapted for a specific application } |
| H01M 10/5012 | .... | { Portable devices, e.g. mobiles, cameras, pacemakers } |
| H01M 10/5014 | ..... | { Power tools } |
| H01M 10/5016 | .... | { Vehicles } |
| H01M 10/5018 | .... | { Stationary plants, e.g. power plant buffering, backup power supplies } |
| H01M 10/502 | ... | { Control systems (measurement of temperature H01M 10/486 ; charging and discharging in response to temperature H01M 10/443) } |
| H01M 10/5022 | .... | { characterized by method steps, e.g. algorithms, flow charts, software details } |
| H01M 10/5024 | .... | { based on ambient temperature } |
| H01M 10/5026 | | { characterised by the use of reversible temperature sensitive devices, e.g. NTC, PTC, bimetal or by control of the internal current flowing through the battery, e.g. by switching (H01M 2/34 takes precedence; Temperature sensitive safety devices for primary or secondary batteries H01M 2200/10) } |

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| H01M 10/5028 | ... | { characterized by the shape of the cells } |
| H01M 10/503 | | { Cylindrical } |
| H01M 10/5032 | .... | { Prismatic or flat, e.g. pouch cells } |
| H01M 10/5034 | ... | { Means for temperature regulation having parts combined with the battery } |
| H01M 10/5036 | .... | { characterized by values or quantitative relationships, e.g. ratios, sizes, formulas, concentrations } |
| H01M 10/5038 | .... | { characterized by gradients (temperature gradients H01M 10/5008) } |
| H01M 10/504 | .... | { characterized by electrically insulating, thermally conductive materials } |
| H01M 10/5042 | .... | { inside the innermost case of the battery, e.g. mandrels, electrodes, electrolytes } |
| H01M 10/5044 | .... | { Solid structures for heat-exchange or conduction } |
| H01M 10/5046 | ..... | { Surfaces specially adapted for heat dissipation or radiation, e.g. fins, coatings } |
| H01M 10/5048 | ..... | { Closed pipes transferring heat by thermal conductivity and phase transition, e.g. heat pipes } |
| H01M 10/5051 | ..... | { Terminals or leads } |
| H01M 10/5053 | ..... | { Solid parts specially adapted for heat conduction other than terminals or leads, e.g. rods, plates } |
| H01M 10/5055 | ..... | { arranged between the cells } |
| H01M 10/5057 | ..... | { Solid parts with flow channels or tubes for heat exchange } |
| H01M 10/5059 | ..... | { arranged between the cells } |
| H01M 10/5061 | .... | { Fluids for heat exchange } |
| H01M 10/5063 | .... | { Gases } |
| H01M 10/5065 | ..... | { freely flowing by convection only } |
| H01M 10/5067 | ..... | { forcedly flowing, e.g. by blowers } |
| H01M 10/5069 | ..... | { Compressed gases } |
| H01M 10/5071 | ..... | { Recirculation or a U-turn in the flow path, i.e. back and forth (H01M 10/5069 takes precedence) } |
| H01M 10/5073 | ..... | [Means within the gas flows giving the gas flows around a cell or a battery a certain direction, e.g. manifolds, baffles, obstacles] |
| H01M 10/5075 | .... | { Liquids } |
| H01M 10/5077 | ..... | {characterised by flow circuits external to the battery or the battery pack } |
| H01M 10/5079 | ..... | { Fluids undergoing a liquid-gas phase change, e.g. evaporation, condensation (heat pipes H01M 10/5048) } |
| H01M 10/5081 | .... | { Electric or electromagnetic means (H01M 2/34 takes precedence) } |
| H01M 10/5083 | ..... | { Resistor heaters (arrangements for heating the battery by its resistance to internal current H01M 10/5026) } |
| H01M 10/5085 | ..... | { Peltier elements or thermo-electric devices } |
| H01M 10/5087 | .... | { Thermal insulation or shielding } |
| H01M 10/5089 | .... | { Heat storage or buffering, e.g. heat capacity, liquid-solid phase changes } |
| H01M 10/5091 | .... | { Chemical reactions other than electrochemical reactions of the battery, e.g. catalytic heaters, burners } |
| H01M 10/5093 | ... | { Heat exchange relationships between a battery and another system, e.g. air-conditioners, central heating systems, vehicle engines, electronic components, fuel cells, capacitors } |

- H01M 10/5095 { the system being an air-conditioner or an engine }
- H01M 10/5097 { the system being an electronic component, e.g. CPU, inverter, capacitor }
- H01M 10/52 . . Removing gases inside the secondary cell, e.g. by absorption (vent plugs or other mechanical arrangements for facilitating escape of gases [H01M 2/12](#))
- H01M 10/523 . . . { by recombination on a catalytic material }
- H01M 10/526 . . . { by gas recombination on the electrode surface or by structuring the electrode surface to improve gas recombination }
- H01M 10/54 . Reclaiming serviceable parts of waste accumulators

H01M 12/00 Hybrid cells; Manufacture thereof

NOTE

Hybrid cells are electrochemical generators having two different types of half-cells, the half-cell being an electrode-electrolyte combination of either a primary, a secondary or a fuel cell.

- H01M 12/005 . { composed of a half-cell of the capacitor type and of a half-cell of the primary or secondary battery type (hybrid capacitors [H01G 9/155](#)) }
- H01M 12/02 . Details (of non-active parts [H01M 2/00](#); of electrodes [H01M 4/00](#))
- H01M 12/04 . composed of a half-cell of the fuel-cell type and of a half-cell of the primary-cell type (methods or arrangements for servicing or maintenance [H01M 6/50](#))
- H01M 12/06 . . with one metallic and one gaseous electrode
- H01M 12/065 . . . {with plate-like electrodes or stacks of plate-like electrodes }
- H01M 12/08 . composed of a half-cell of a fuel-cell type and a half-cell of the secondary-cell type (methods or arrangements for servicing or maintenance, e.g. for charging, [H01M 10/42](#))
- H01M 12/085 . . {Zinc-halogen cells or batteries }

H01M 14/00 Electrochemical current or voltage generators not provided for in groups [H01M 6/00](#) - [H01M 12/00](#); Manufacture thereof

- H01M 14/005 . { Photoelectrochemical storage cells (light sensitive devices [H01G 9/20](#), semiconductors sensitive to light [H01L 131/00](#)) }

H01M 16/00 Structural combinations of different types of electrochemical generators

- H01M 16/003 . { of fuel cells with other electrochemical devices, e.g. capacitors, electrolyzers }
- H01M 16/006 . . { of fuel cells with rechargeable batteries }

H01M 2002/00 Constructional details or processes of manufacture of the non-active parts

- H01M 2002/02 . Cases, jackets or wrappings (working of plastics or substances in plastic state [B29](#))
- H01M 2002/0202 . . {for small-sized cells or batteries, e.g. miniature battery or power cells, batteries or

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|--------------------------------|--|
| | cells for portable equipment (H01M 2/025 takes precedence) } |
| H01M 2002/0205 | ... Cases with a shape not covered by groups H01M 2/0207 to T01M 2/02B6 |
| H01M 2002/0257 | .. {characterised by the material } |
| H01M 2002/0297 | ... characterised by physical parameters |
| H01M 2004/00 | Electrodes (electrodes for electrolytic processes C25 , { electrodes for hybrid or electric double capacitor H01G 11/22 }) |
| H01M 2004/02 | . Electrodes composed of or comprising active material |
| H01M 2004/021 | .. Physical characteristics, e.g. porosity, surface area |
| H01M 2004/022 | .. Electrodes made of one single microscopic fiber |
| H01M 2004/023 | .. Gel electrode |
| H01M 2004/024 | .. Insertable electrodes |
| H01M 2004/025 | .. with shapes other than plane or cylindrical |
| H01M 2004/026 | .. characterised by the polarity |
| H01M 2004/027 | ... Negative electrodes |
| H01M 2004/028 | ... Positive electrodes |
| H01M 2004/029 | ... Bipolar electrodes |
| H01M 2004/86 | . Inert electrodes with catalytic activity, e.g. for fuel cells |
| H01M 2004/8678 | .. characterised by the polarity |
| H01M 2004/8684 | ... Negative electrodes |
| H01M 2004/8689 | ... Positive electrodes |
| H01M 2004/8694 | ... Bipolar electrodes |
| H01M 2006/00 | Primary cells; Manufacture thereof |
| | <u>NOTE</u> |
| | In this group, primary cells are electrochemical generators in which the cell energy is present in chemical form and is not regenerated. |
| H01M 2006/04 | . Cells with aqueous electrolyte |
| H01M 2006/06 | .. Dry cells, i.e. cells wherein the electrolyte is rendered non-fluid |
| H01M 2006/10 | ... with wound or folded electrodes |
| H01M 2006/106 | Elliptic wound cells |
| H01M 2006/50 | . Methods or arrangements for servicing or maintenance, e.g. maintaining operating temperature { (cells or batteries combined with safety devices H01M 2200/00) } |
| H01M 2006/5094 | .. Aspects relating to capacity ratio of electrolyte/electrodes or anode/cathode |
| H01M 2008/00 | Fuel cells; Manufacture thereof |
| | <u>NOTE</u> |

Fuel cells are electrochemical generators wherein the reactants are supplied from outside

- H01M 2008/10 . Fuel cells with solid electrolytes
- H01M 2008/1095 . . Fuel cells with polymeric electrolytes
- H01M 2008/12 . . operating at high temperature, e.g. with stabilised ZrO₂ electrolyte
- H01M 2008/128 . . . Fuel cells with solid halide electrolytes
- H01M 2008/1293 . . . Fuel cells with solid oxide electrolytes
- H01M 2008/14 . Fuel cells with fused electrolytes
- H01M 2008/147 . . Fuel cells with molten carbonates

H01M 2010/00 **Secondary cells; Manufacture thereof**

NOTE

Secondary cells are accumulators receiving and supplying electrical energy by means of reversible electrochemical reactions.

- H01M 2010/04 . Construction or manufacture in general ([H01M 10/12](#), [H01M 10/28](#), [H01M 10/38](#) take precedence)
- H01M 2010/0495 . . Nanobatteries
- H01M 2010/42 . Methods or arrangements for servicing or maintenance of secondary cells or secondary half-cells
- H01M 2010/425 . . { Structural combination with electronic components, e.g. electronic circuits integrated to the outside of the casing ([printed circuits H05K 1/00](#)) }
- H01M 2010/4271 . . . Battery management systems including electronic circuits, e.g. control of current or voltage to keep battery in healthy state, cell balancing
- H01M 2010/4278 . . . Systems for data transfer from batteries, e.g. transfer of battery parameters to a controller, data transferred between battery controller and main controller
- H01M 2010/4292 . . Aspects relating to capacity ratio of electrodes/electrolyte or anode/cathode

H01M 2200/00 **Safety devices for primary or secondary batteries**

- H01M 2200/10 . Temperature sensitive devices
- H01M 2200/101 . . Bimetal
- H01M 2200/103 . . Fuse
- H01M 2200/105 . . NTC
- H01M 2200/106 . . PTC
- H01M 2200/108 . . Normal resistors
- H01M 2200/20 . Pressure-sensitive devices
- H01M 2200/30 . Preventing polarity reversal

H01M 2220/00 Batteries for particular applications

- H01M 2220/10 . Batteries in stationary systems, e.g. emergency power source in plant
- H01M 2220/20 . Batteries in motive systems, e.g. vehicle, ship, plane
- H01M 2220/30 . Batteries in portable systems, e.g. mobile phone, laptop

H01M 2250/00 Fuel cells for particular applications; Specific features of fuel cell system

- H01M 2250/10 . Fuel cells in stationary systems, e.g. emergency power source in plant
- H01M 2250/20 . Fuel cells in motive systems, e.g. vehicle, ship, plane
- H01M 2250/30 . Fuel cells in portable systems, e.g. mobile phone, laptop
- H01M 2250/40 . Combination of fuel cells with other energy production systems
- H01M 2250/402 . . Combination of fuel cell with other electric generators ([combination of fuel cells with other electrochemical generator H01M 16/003](#))
- H01M 2250/405 . . Cogeneration of heat or hot water
- H01M 2250/407 . . Combination of fuel cells with mechanical energy generators

H01M 2300/00 Electrolytes

- H01M 2300/0002 . Aqueous electrolytes
- H01M 2300/0005 . . Acid electrolytes
- H01M 2300/0008 . . . Phosphoric acid-based
- H01M 2300/0011 . . . Sulfuric acid-based
- H01M 2300/0014 . . Alkaline electrolytes
- H01M 2300/0017 . Non-aqueous electrolytes
- H01M 2300/002 . . Inorganic electrolyte
- H01M 2300/0022 . . . Room temperature molten salts
- H01M 2300/0025 . . Organic electrolyte
- H01M 2300/0028 . . . characterised by the solvent
- H01M 2300/0031 Chlorinated solvents
- H01M 2300/0034 Fluorinated solvents
- H01M 2300/0037 Mixture of solvents
- H01M 2300/004 Three solvents
- H01M 2300/0042 Four or more solvents
- H01M 2300/0045 . . . Room temperature molten salts comprising at least one organic ion
- H01M 2300/0048 . . Molten electrolytes used at high temperature
- H01M 2300/0051 . . . Carbonates
- H01M 2300/0054 . . . Halogenides

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|----------------|-------|--|
| H01M 2300/0057 | | Chlorides |
| H01M 2300/006 | ... | Hydroxides |
| H01M 2300/0062 | ... | Nitrates |
| H01M 2300/0065 | .. | Solid electrolytes |
| H01M 2300/0068 | ... | inorganic |
| H01M 2300/0071 | .... | Oxides |
| H01M 2300/0074 | ..... | Ion conductive at high temperature |
| H01M 2300/0077 | ..... | based on zirconium oxide |
| H01M 2300/008 | .... | Halides |
| H01M 2300/0082 | ... | Organic polymers |
| H01M 2300/0085 | . | Immobilising or gelification of electrolyte |
| H01M 2300/0088 | . | Composites |
| H01M 2300/0091 | .. | in the form of mixtures |
| H01M 2300/0094 | .. | in the form of layered products, e.g. coatings |
| H01M 2300/0097 | ... | with adhesive layers |