

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 state B29](#))
- 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 2002/0205 ... {Cases with a shape not covered by groups [H01M 2/0207](#) to [H01M 2/0235](#)}
- 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](#))}

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|----------------|-------|---|
| H01M 2/0257 | .. | {characterised by the material} |
| H01M 2/026 | ... | { for small-sized cells or batteries, batteries or cells for portable equipment} |
| 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 2002/0297 | ... | {characterised by physical parameters } |
| 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} |

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| 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

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| 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} |

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| 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 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 4/04 | .. Processes of manufacture in general |
| H01M 4/0402 | ... { Methods of deposition of the material } |
| H01M 4/0404 | { by coating on electrode collectors } |
| 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 calendering } |
| 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 } |

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| 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} |
| 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 |

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| 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 |
| 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} |

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| 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. LiTi2O4 or LiTi2OxFy (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. LiMn2O4 or LiMn2OxFy |
| 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, 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 |
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| 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 |
| 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 |

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| 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 2004/8678 | .. | {characterised by the polarity } |
| H01M 2004/8684 | ... | {Negative electrodes } |
| H01M 2004/8689 | ... | {Positive electrodes } |
| H01M 2004/8694 | ... | {Bipolar electrodes } |
| H01M 4/88 | .. | Processes of manufacture |
| H01M 4/8803 | ... | { Supports for the deposition of the catalytic active composition (H01M 4/90 takes precedence)} |
| H01M 4/8807 | .... | { Gas diffusion layers} |
| H01M 4/881 | | { Electrolytic membranes} |
| H01M 4/8814 | | { Temporary supports, e.g. decal} |

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| 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)} |

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| 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.

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| 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 2006/106 | .... | {Elliptic wound cells } |
| H01M 6/12 | ... | with flat electrodes |
| H01M 6/14 | . | Cells with non-aqueous electrolyte (H01M 10/05 takes precedence) |
| H01M 6/145 | .. | {containing ammonia} |
| H01M 6/16 | .. | with organic electrolyte (H01M 6/18 ,{ H01M 10/05 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](#), [H01L 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 2006/5094 . . {Aspects relating to capacity ratio of electrolyte/electrodes or anode/cathode }

- 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 M_1MeO_3 , M_1 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}

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| 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 |

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|--------------|-------|---|
| 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)} |

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| 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)} |
| 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} |

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| 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} |

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| 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 |
| 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

| | | |
|-------------|-------|--|
| 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} |
| 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 2008/1095 | .. | {Fuel cells with polymeric electrolytes} |
| 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 2008/128 | ... | {Fuel cells with solid halide electrolytes} |
| H01M 8/1286 | ... | { Fuel cells applied on a support, e.g. miniature fuel cells deposited on a silica support} |
| H01M 2008/1293 | ... | {Fuel cells with solid oxide electrolytes} |
| 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 T01M 300/B6H)} |
| H01M 2008/147 | .. | {Fuel cells with molten carbonates} |
| 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 2010/0495 .. {Nanobatteries }

- 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}
- H01M 10/4264 ... { with capacitors}
- 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 10/4285 .. {Testing apparatus}
- H01M 2010/4292 .. {Aspects relating to capacity ratio of electrodes/electrolyte or anode/cathode }
- 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](#)**, [H01M 2200/10-H01M 2200/108](#)

| | | |
|--------------|-------|--|
| 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)} |
| 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 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 |
| 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 |