

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 [T01M 2/02B6](#)
- 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 }
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 }
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 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 }
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](#)

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
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, 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

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
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 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) }

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, calendaring (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 2006/106 Elliptic wound cells
- 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 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 }
- 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) }
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
- 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 T01M300/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](#), [T01M 6/50S2-T01M 6/50S2R](#)

- 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