

**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-Cl<sub>2</sub> 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 ( <a href="#">H01M 2/029</a> 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 ( <a href="#">H01M 2/0443</a> 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 ( <a href="#">H01M 2/0417</a> 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 ( <a href="#">H01M 2/0443</a> 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 <a href="#">H01M 10/46</a> )
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 <a href="#">H01M 2220/30</a> )}
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 <a href="#">H01M 2220/10</a> , batteries in motive systems <a href="#">H01M 2220/20</a> )}
H01M 2/1077	....	{Racks, groups of several batteries ( <a href="#">H01M 2/1088</a> 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 <a href="#">H01M 2200/00</a> )}
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 ( <a href="#">H01M 4/0438</a> , 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 ( <a href="#">use of alloy compositions as active materials</a> <a href="#">H01M 4/38</a> )
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 <a href="#">H01G 11/30-H01G 11/50</a> )}
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 ( <a href="#">H01M 4/40</a> takes precedence)}
H01M 4/382	.....	{Lithium ( <a href="#">H01M 4/405</a> takes precedence)}
H01M 4/383	....	{Hydrogen absorbing alloys}
H01M 4/385	.....	{of the type LaNi <sub>5</sub> }
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. $\text{LiTi}_2\text{O}_4$ or $\text{LiTi}_2\text{O}_x\text{F}_y$ (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. $\text{LiMn}_2\text{O}_4$ or $\text{LiMn}_2\text{O}_x\text{F}_y$
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. $\text{LiNiO}_2$ , $\text{LiCoO}_2$ or $\text{LiCoO}_x\text{F}_y$
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 $\text{LiCoF}_y$
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}
<b>NOTE</b>		
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 $\text{CF}_x$
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 <a href="#">H01G 11/66</a> )}
H01M 4/66	...	Selection of materials
H01M 4/661	....	{Metal or alloys, e.g. alloy coatings ( <a href="#">H01M 4/669</a> take precedence)}
H01M 4/662	.....	{Alloys (collectors of lead alloys <a href="#">H01M 4/685</a> )}
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 ( <a href="#">H01M 4/668</a> 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. <a href="#">B21D</a> ; <a href="#">B22D</a> )
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 ( <a href="#">H01M 4/861</a> 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 ( <a href="#">H01M 4/90</a> takes precedence)}
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 <a href="#">H01M 8/0245</a> )}
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 ( <a href="#">membrane electrode assemblies H01M 8/1004</a> )}
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 ( <a href="#">H01M 4/92</a> 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 ( <a href="#">H01M 4/8807</a> , <a href="#">H01M 4/881</a> , <a href="#">H01M 4/8814</a> , <a href="#">H01M 4/925</a> 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 10/05 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 . . . {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 M1MeO3, M1 being an alkaline earth metal or rare earth metal, Me being a metal, e.g. perovskites}
        - H01M 8/0219      .....      {Chromium complex oxides}
      - H01M 8/0221      ....      {Polymers or organic resins}
      - H01M 8/0223      ....      {Composites}
        - H01M 8/0226      .....      {in the form of mixtures}
        - H01M 8/0228      .....      {in the form of layered products, e.g. coatings}
    - H01M 8/023      ...      {Porous and characterised by the material}
      - H01M 8/0232      ....      {Metals or alloys}
      - H01M 8/0234      ....      {Carbonaceous material}
      - H01M 8/0236      ....      {Glass, ceramics or cermets}
      - H01M 8/0239      ....      {Polymers or organic resins}
      - H01M 8/0241      ....      {Composites}
        - H01M 8/0243      .....      {in the form of mixtures}
        - H01M 8/0245      .....      {in the form of layered products, e.g. coatings}
      - H01M 8/0247      ...      {Porous or non porous and characterised by the form (characterised by a channel configuration [H01M 8/0258](#))}
    - H01M 8/025      ....      {Semicylindrical}



H01M 8/0252	....	{Tubular}
H01M 8/0254	....	{Corrugated or undulate shaped}
H01M 8/0256	....	{Vias, i.e. connector passing through the separator material}
H01M 8/0258	...	{Porous or non-porous and characterised by a channel configuration, i.e. by the flow field}
H01M 8/026	....	{Grooves characteristics, pitch, depth}
H01M 8/0263	....	{Meander or serpentine path}
H01M 8/0265	....	{Variable section of reactant channel}
H01M 8/0267	...	{Heating or cooling facilities in the separators, collectors or interconnectors}
H01M 8/0269	...	{Separators, collectors or interconnectors including a printed circuit board}
H01M 8/0271	..	{of surrounding electrodes, matrices, membranes or fuel cell elements with sealing or supporting material}
H01M 8/0273	...	{in the form of a frame; Frame materials; Way of attaching to frames}
H01M 8/0276	...	{Seals characterised by their form}
H01M 8/0278	....	{O-rings}
H01M 8/028	...	{Seals characterised by their composition}
H01M 8/0282	....	{Inorganic material}
H01M 8/0284	....	{Organic resins or polymers}
H01M 8/0286	...	{Process of seal formation}
H01M 8/0289	..	{of membranes or electrolyte holding means}
H01M 8/0291	...	{Matrices; Diaphragms; Membranes}
H01M 8/0293	....	{for immobilising electrolyte solutions}
H01M 8/0295	....	{for immobilising electrolyte melts}
H01M 8/0297	..	{of joining electrodes, reservoir layers, heat exchange units or bipolar separators to each other}
H01M 8/04	.	Auxiliary arrangements or processes, e.g. for control of pressure, for circulation of fluids
H01M 8/04007	..	{Arrangements or means or processes related to heat exchange or temperature measurements (methods for controlling fuel cells or fuel cell systems <a href="#">H01M 8/04298</a> )}
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 <a href="#">F28</a> , heat exchangers for fuel cells <a href="#">F28D 2021/0043</a> )}
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 ( <a href="#">H01M 8/04119</a> , <a href="#">H01M 8/04104</a> 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 ( <a href="#">detection of defective fuel cells H01M 8/04664</a> , <a href="#">methods for shunting fuel cells H01M 8/04955</a> )}
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 ( <a href="#">H01M 8/04119</a> takes precedence; <a href="#">Treatment of electrolyte residue H01M 8/0693</a> )}
H01M 8/04283	...	{Supply means of electrolyte to or in matrix-fuel cells}
H01M 8/04291	..	{Electrolyte- or water-management of solid electrolyte cells ( <a href="#">H01M 8/04119</a> takes precedence)}
H01M 8/04298	..	{Methods for controlling fuel cells or fuel cell systems ( <a href="#">means for control H01M 8/04007</a> to <a href="#">H01M 8/04291</a> )}
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 <a href="#">H01M 8/04223</a> )}
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 ( <a href="#">Hydrogen C01B 3/00</a> , <a href="#">reactors for physicochemical processes B01J 19/00</a> )}
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 ( <a href="#">H01M 8/065</a> takes precedence)}
H01M 8/0662	..	{Treatment of gaseous reactants or gaseous residues, e.g. cleaning ( <a href="#">humidifying or dehumidifying of gaseous reactants H01M 8/04119</a> )}
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 ( <a href="#">H01M 8/12</a> 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 ( <a href="#">H01M 8/12</a> 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 ( <a href="#">H01M 8/12</a> 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 <a href="#">H01M 8/1058</a> , semi-permeable membrane composition <a href="#">B01D 71/00</a> , ion-exchange membrane <a href="#">C08J 5/22</a> )}

**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 <sub>2</sub> , ZrO <sub>2</sub> }
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 <a href="#">H01M 8/0293</a> , <a href="#">H01M 8/0295</a> )}
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 <a href="#">B01D 69/00</a> )}
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 <a href="#">B01D 67/00</a> ; manufacture of ion-exchange membrane <a href="#">C08J 5/22</a> )}
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 <sub>2</sub> 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 <a href="#">H01M 2300/0074</a> )}
H01M 8/1253	.....	{the electrolyte containing zirconium oxide (solid electrolyte based on zirconium oxide <a href="#">H01M 2300/0077</a> )}
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 <a href="#">H01M 2300/008</a> )}
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 [H01M 2300/006](#))}
- 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-SOCl<sub>2</sub> 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 10/60 takes precedence](#))
- 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 10/52 .. 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 10/60 . Heating or cooling; Temperature control
- H01M 10/61 .. Types of temperature control
- H01M 10/613 ... Cooling or keeping cold
- H01M 10/615 ... Heating or keeping warm
- H01M 10/617 ... for achieving uniformity or desired distribution of temperature

H01M 10/62	..	specialy adapted for specific applications
H01M 10/623	...	Portable devices, e.g. mobile telephones, cameras or pacemakers
H01M 10/6235	....	Power tools
H01M 10/625	...	Vehicles
H01M 10/627	...	Stationary installations, e.g. power plant buffering or backup power supplies
H01M 10/63	..	Control systems ( <a href="#">measurement of temperature H01M 10/486</a> ; <a href="#">charging or discharging in response to temperature H01M 10/443</a> )
H01M 10/633	...	characterised by algorithms, flow charts, software details or the like
H01M 10/635	...	based on ambient temperature
H01M 10/637	...	characterised by the use of reversible temperature-sensitive devices, e.g. NTC, PTC or bimetal devices; characterised by control of the internal current flowing through the cells, e.g. by switching ( <a href="#">H01M 2/34 takes precedence</a> )
H01M 10/64	..	characterised by the shape of the cells
H01M 10/643	...	Cylindrical cells
H01M 10/647	...	Prismatic or flat cells, e.g. pouch cells
H01M 10/65	..	Means for temperature control structurally associated with the cells
H01M 10/651	...	characterised by parameters specified by a numeric value or mathematical formula, e.g. ratios, sizes or concentrations
H01M 10/652	....	characterised by gradients ( <a href="#">for achieving a desired temperature gradient H01M 10/617</a> )
H01M 10/653	...	characterised by electrically insulating or thermally conductive materials
H01M 10/654	...	located inside the innermost case of the cells, e.g. mandrels, electrodes or electrolytes
H01M 10/655	...	Solid structures for heat exchange or heat conduction
H01M 10/6551	....	Surfaces specially adapted for heat dissipation or radiation, e.g. fins or coatings
H01M 10/6552	....	Closed pipes transferring heat by thermal conductivity or phase transition, e.g.heat pipes
H01M 10/6553	....	Terminals or leads
H01M 10/6554	....	Rods or plates
H01M 10/6555	.....	arranged between the cells
H01M 10/6556	....	Solid parts with flow channel passages or pipes for heat exchange ( <a href="#">closed pipes H01M 10/6552</a> )
H01M 10/6557	.....	arranged between the cells
H01M 10/656	...	characterised by the type of heat-exchange fluid
H01M 10/6561	....	Gases
H01M 10/6562	.....	with free flow by convection only
H01M 10/6563	.....	with forced flow, e.g. by blowers
H01M 10/6564	.....	using compressed gas
H01M 10/6565	.....	with recirculation or U-turn in the flow path, i.e. back and forth
H01M 10/6566	.....	Means within the gas flow to guide the flow around one or more cells, e.g. manifolds, baffles or other barriers ( <a href="#">H01M 10/6565 takes precedence</a> )
H01M 10/6567	....	Liquids

- H01M 10/6568 . . . . . characterised by flow circuits, e.g. loops, located externally to the cells or cell casings
- H01M 10/6569 . . . . Fluids undergoing a liquid-gas phase change or transition, e.g. evaporation or condensation ([heat pipes H01M 10/6552](#))
- H01M 10/657 . . . . by electric or electromagnetic means
- H01M 10/6571 . . . . Resistive heaters ([arrangements for heating the battery by its resistance to the internal current H01M 10/637](#))
- H01M 10/6572 . . . . Peltier elements or thermoelectric devices
- H01M 10/658 . . . . by thermal insulation or shielding
- H01M 10/659 . . . . by heat storage or buffering, e.g. heat capacity or liquid-solid phase changes or transition
- H01M 10/6595 . . . . by chemical reactions other than electrochemical reactions of the cells, e.g. catalytic heaters or burners
- H01M 10/66 . . . Heat-exchange relationships between the cells and other systems, e.g. central heating systems or fuel cells
- H01M 10/663 . . . the system being an air-conditioner or an engine
- H01M 10/667 . . . the system being an electronic component, e.g. a CPU, an inverter or a capacitor

## **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 31/00](#))}

## **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