

**CPC****COOPERATIVE PATENT CLASSIFICATION****H01G**

**CAPACITORS; CAPACITORS, RECTIFIERS, DETECTORS, SWITCHING DEVICES OR LIGHT-SENSITIVE DEVICES, OF THE ELECTROLYTIC TYPE** (selection of specified materials as dielectric [H01B 3/00](#); {ceramics [C04B](#)})

**H01G 2/00**

**Details of capacitors not covered by a single one of groups [H01G 4/00-H01G 11/00](#)**

[H01G 2/02](#)

- . Mountings

[H01G 2/04](#)

- . . specially adapted for mounting on a chassis

[H01G 2/06](#)

- . . specially adapted for mounting on a printed-circuit support

[H01G 2/065](#)

- . . . { for surface mounting, e.g. chip capacitors}

[H01G 2/08](#)

- . Cooling arrangements; Heating arrangements; Ventilating arrangements

[H01G 2/10](#)

- . Housing; Encapsulation { **WARNING: Not complete, see also [H01G 4/224](#)**}

[H01G 2/103](#)

- . . { Sealings, e.g. for lead-in wires; Covers}

[H01G 2/106](#)

- . . { Fixing the capacitor in a housing}

[H01G 2/12](#)

- . Protection against corrosion ([H01G 2/10](#) takes precedence)

[H01G 2/14](#)

- . Protection against electric or thermal overload (by cooling [H01G 2/08](#))

[H01G 2/16](#)

- . . with fusing elements

[H01G 2/18](#)

- . . with breakable contacts

[H01G 2/20](#)

- . Arrangements for preventing discharge from edges of electrodes

[H01G 2/22](#)

- . Electrostatic or magnetic shielding

[H01G 2/24](#)

- . Distinguishing marks, e.g. colour coding

**H01G 4/00**

**Fixed capacitors; Processes of their manufacture** (electrolytic capacitors [H01G 9/00](#))

[H01G 4/002](#)

- . Details

[H01G 4/005](#)

- . . Electrodes

[H01G 4/008](#)

- . . . Selection of materials

[H01G 4/0085](#)

- . . . . { Fried electrodes}

[H01G 4/01](#)

- . . . Form of self-supporting electrodes

[H01G 4/012](#)

- . . . Form of non-self-supporting electrodes

[H01G 4/015](#)

- . . . Special provisions for self-healing

[H01G 4/018](#)

- . . Dielectrics

[H01G 4/02](#)

- . . . Gas or vapour dielectrics

H01G 4/04	...	Liquid dielectrics
H01G 4/06	.	Solid dielectrics
H01G 4/08	..	Inorganic dielectrics
H01G 4/085	...	{ Vapour deposited}
H01G 4/10	...	Metal-oxide dielectrics {(H01G 4/085 takes precedence)}
H01G 4/105	....	{Glass dielectric}
H01G 4/12	...	Ceramic dielectrics {(H01G 4/085 takes precedence; ceramic materials per se C04B 35/00)}
H01G 4/1209	....	{characterised by the ceramic dielectric material (H01G 4/1272, H01G 4/1281 take precedence)}
H01G 4/1218	.....	{based on titanium oxides or titanates (H01G 4/1245 takes precedence)}
H01G 4/1227	.....	{ based on alkaline earth titanates}
H01G 4/1236	.....	{based on zirconium oxides or zirconates (H01G 4/1263 takes precedence)}
H01G 4/1245	.....	{containing also titanates}
H01G 4/1254	.....	{based on niobium or tungsten, tantalum oxides or niobates, tantalates}
H01G 4/1263	.....	{containing also zirconium oxides or zirconates}
H01G 4/1272	....	{Semiconductive ceramic capacitors}
H01G 4/1281	.....	{with grain boundary layer}
H01G 4/129	....	{containing a glassy phase, e.g. glass ceramic}
H01G 4/14	..	Organic dielectrics
H01G 4/145	...	{vapour deposited}
H01G 4/16	...	of fibrous material, e.g. paper
H01G 4/18	...	of synthetic material, e.g. derivatives of cellulose (H01G 4/16 takes precedence)
H01G 4/183	....	{Derivatives of cellulose (H01G 4/145 takes precedence)}
H01G 4/186	....	{halogenated (H01G 4/145 takes precedence)}
H01G 4/20	..	using combinations of dielectrics from more than one of groups H01G 4/02 to H01G 4/06(H01G 4/12 takes precedence)
H01G 4/203	...	{ Fibrous material or synthetic material}
H01G 4/206	...	{inorganic and synthetic material}
H01G 4/22	....	impregnated
H01G 4/221	.....	{ characterised by the composition of the impregnant}
H01G 4/222	.....	{ halogenated}
H01G 4/224	..	Housing; Encapsulation
H01G 4/228	..	Terminals
H01G 4/232	...	electrically connecting two or more layers of a stacked or rolled capacitor
H01G 4/2325	....	{ characterised by the material of the terminals}
H01G 4/236	...	leading through the housing, i.e. lead-through
H01G 4/242	...	the capacitive element surrounding the terminal
H01G 4/245	...	Tabs between the layers of a rolled electrode
H01G 4/248	...	the terminals embracing or surrounding the capacitive element, e.g. caps (H01G 4/252 takes precedence)
H01G 4/252	...	the terminals being coated on the capacitive element (H01G 4/232 takes

- precedence)
- H01G 4/255 . . Means for correcting the capacitance value
  - H01G 4/258 . . Temperature compensation means
  - H01G 4/26 . Folded capacitors
  - H01G 4/28 . Tubular capacitors
  - H01G 4/30 . Stacked capacitors ([H01G 4/33](#) takes precedence)
  - H01G 4/302 . . {obtained by injection of metal in cavities formed in a ceramic body}
  - H01G 4/304 . . {obtained from a another capacitor}
  - H01G 4/306 . . {made by thin film techniques}
  - H01G 4/308 . . {made by transfer techniques}
  - H01G 4/32 . Wound capacitors
  - H01G 4/33 . Thin- or thick-film capacitors ([thin- or thick-film circuits H01L 27/00](#){ capacitors without a potential-jump or surface barrier specially adapted for integrated circuits, details thereof, multistep manufacturing processes therefor [H01L 28/40](#)})
  - H01G 4/35 . Feed-through capacitors or anti-noise capacitors
  - H01G 4/38 . Multiple capacitors, i.e. structural combinations of fixed capacitors
  - H01G 4/385 . . {Single unit multiple capacitors, e.g. dual capacitor in one coil}
  - H01G 4/40 . Structural combinations of fixed capacitors with other electric elements, the structure mainly consisting of a capacitor, e.g. RC combinations ([thin or thick film circuits H01L 27/00](#); { capacitors without a potential-jump or surface barrier specially adapted for integrated circuits, details thereof, multistep manufacturing processes therefor [H01L 28/40](#)})
  - H01G 5/00 Capacitors in which the capacitance is varied by mechanical means, e.g. by turning a shaft; Processes of their manufacture**
  - H01G 5/01 . Details
  - H01G 5/011 . . Electrodes
  - H01G 5/012 . . . at least one of the electrodes being a displaceable liquid or powder
  - H01G 5/013 . . Dielectrics
  - H01G 5/0132 . . . { Liquid dielectrics}
  - H01G 5/0134 . . . { Solid dielectrics}
  - H01G 5/0136 . . . . { with movable electrodes}
  - H01G 5/0138 . . . . { with movable dielectrics}
  - H01G 5/014 . . Housing; Encapsulation
  - H01G 5/015 . . Current collectors
  - H01G 5/017 . . Temperature compensation
  - H01G 5/019 . . Means for correcting the capacitance characteristics

- H01G 5/04 . using variation of effective area of electrode
- H01G 5/06 . . due to rotation of flat or substantially flat electrodes
- H01G 5/08 . . . becoming active in succession
- H01G 5/10 . . due to rotation of helical electrodes
- H01G 5/12 . . due to rotation of part-cylindrical, conical, or spherical electrodes
- H01G 5/14 . . due to longitudinal movement of electrodes
- H01G 5/145 . . . { with profiled electrodes}
  
- H01G 5/16 . using variation of distance between electrodes
- H01G 5/18 . . due to change in inclination, e.g. by flexing, by spiral wrapping
  
- H01G 5/38 . Multiple capacitors, e.g. ganged
  
- H01G 5/40 . Structural combinations of variable capacitors with other electric elements not covered by this subclass, the structure mainly consisting of a capacitor, e.g. RC combinations (RC-filters H03H)
  
- H01G 7/00** **Capacitors in which the capacitance is varied by non-mechanical means; Processes of their manufacture (capacitors with potential jump or surface barrier H01L 29/00)**
  
- H01G 7/02 . Electrets, i.e. having a permanently-polarised dielectric
- H01G 7/021 . . {having an organic dielectric}
- H01G 7/023 . . . {of macromolecular compounds}
- H01G 7/025 . . {having an inorganic dielectric}
- H01G 7/026 . . . {with ceramic dielectric}
- H01G 7/028 . . {having a heterogeneous dielectric}
  
- H01G 7/04 . having a dielectric selected for the variation of its permittivity with applied temperature
  
- H01G 7/06 . having a dielectric selected for the variation of its permittivity with applied voltage, i.e. ferroelectric capacitors (electrets H01G 7/02)
  
- H01G 9/00** **Electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices; Processes of their manufacture**
  
- H01G 9/0003 . {Protection against electric or thermal overload; cooling arrangements; means for avoiding the formation of cathode films (H01G 9/12 takes precedence)}
  
- H01G 9/0029 . { Processes of manufacture}
- H01G 9/0032 . . { formation of the dielectric layer (anodisation in general C25D)}
- H01G 9/0036 . . { Formation of the solid electrolyte layer}
  
- H01G 9/004 . Details
- H01G 9/008 . . Terminals
- H01G 9/012 . . . specially adapted for solid capacitors

- H01G 9/016 . . . specially adapted for double-layer capacitors
- H01G 9/02 . Diaphragms; Separators
- H01G 9/022 . Electrolytes, absorbents (electrolytic or electrophoretic processes, apparatus therefor C25; for primary, secondary or fuel cells H01M)
- H01G 9/025 . . Solid electrolytes ([H01G 11/54 takes precedence](#) )
- H01G 9/028 . . . Organic semiconducting electrolytes, e.g. TCNQ
- H01G 9/032 . . . Inorganic semiconducting electrolytes, e.g. MnO<sub>2</sub>
- H01G 9/035 . . Liquid electrolytes, e.g. impregnating materials ([H01G 11/54 takes precedence](#))
- H01G 9/038 . . Electrolytes specially adapted for double-layer capacitors

**WARNING**

This group is no longer used for classification of new documents as from October 1, 2012. The backfile is being continuously reclassified to group [H01G 11/54](#)

- H01G 9/04 . Electrodes { or formation of dielectric layers thereon}
- H01G 9/042 . . characterised by the material ([H01G 11/22 takes precedence](#))
- H01G 9/0425 . . . { specially adapted for cathode}
- H01G 9/045 . . . based on aluminium
- H01G 9/048 . . characterised by their structure ([H01G 11/22 takes precedence](#))
- H01G 9/052 . . . Sintered electrodes
- H01G 9/0525 . . . . { Powder therefor (metallic powder in general B22F)}
- H01G 9/055 . . . Etched foil electrodes
- H01G 9/058 . . specially adapted for double-layer capacitors

**WARNING**

This group is no longer used for classification of new documents as from October 1, 2012. The backfile is being continuously reclassified to group [H01G 11/22](#)

- H01G 9/06 . . . Mounting in containers

**WARNING**

This group is no longer used for classification of new documents as from October 1, 2012. The backfile is being continuously reclassified to groups [H01G 11/66](#) - [H01G 11/74](#)

- H01G 9/07 . . Dielectric layers
- H01G 9/08 . . Housing; Encapsulation
- H01G 9/10 . . . Sealing, e.g. of lead-in wires
- H01G 9/12 . . . Vents or other means allowing expansion
- H01G 9/14 . . Structural combinations { or circuits} for modifying, or compensating for, electric characteristics of electrolytic capacitors ([impedance networks H03H](#))

H01G 9/145 . Liquid electrolytic capacitors ([H01G 11/00](#) takes precedence)

H01G 9/15 . Solid electrolytic capacitors ([H01G 11/00](#) takes precedence)

H01G 9/151 . . { with wound foil electrodes}

H01G 9/153 . . { Skin fibre}

H01G 9/155 . Double-layer capacitors

### **WARNING**

This group is no longer used for classification of new documents as from October 1, 2012. The backfile is being continuously reclassified to group [H01G 11/00](#) and its subgroups

H01G 9/16 . specially for use as rectifiers or detectors ([H01G 9/22](#) takes precedence)

H01G 9/18 . Self-interrupters

H01G 9/20 . Light-sensitive devices

H01G 9/2004 . . {characterised by the electrolyte, e.g. comprising an organic electrolyte}

H01G 9/2009 . . . {Solid electrolytes}

H01G 9/2013 . . . { the electrolyte comprising ionic liquids, e.g. alkyl imidazolium iodide}

H01G 9/2018 . . . { characterised by the ionic charge transport species, e.g. redox shuttles}

H01G 9/2022 . . {characterized by the counter electrode}

H01G 9/2027 . . {comprising an oxide semiconductor electrode}

H01G 9/2031 . . . { comprising titanium oxide, e.g. TiO<sub>2</sub> ([H01G 9/2036](#) takes precedence)}

H01G 9/2036 . . . {comprising mixed oxides, e.g. ZnO covered TiO<sub>2</sub> particles}

H01G 9/204 . . . { comprising zinc oxides, e.g. ZnO ([H01G 9/2036](#) takes precedence)}

H01G 9/2045 . . {comprising a semiconductor electrode comprising elements of the fourth group of the Periodic System (C, Si, Ge, Sn, Pb) with or without impurities, e.g. doping materials}

H01G 9/205 . . {comprising a semiconductor electrode comprising AIII-BV compounds with or without impurities, e.g. doping materials}

H01G 9/2054 . . { comprising a semiconductor electrode comprising AII-BVI compounds, e.g. CdTe, CdSe, ZnTe, ZnSe, with or without impurities, e.g. doping materials ([H01G 9/2027](#) takes precedence)}

H01G 9/2059 . . {comprising an organic dye as the active light absorbing material, e.g. adsorbed on an electrode or dissolved in solution}

H01G 9/2063 . . . {comprising a mixture of two or more dyes}

H01G 9/2068 . . {Panels or arrays of photoelectrochemical cells, e.g. photovoltaic modules based on photoelectrochemical cells}

H01G 9/2072 . . . {comprising two or more photoelectrodes sensible to different parts of the solar spectrum, e.g. tandem cells}

H01G 9/2077 . . . { Sealing arrangements, e.g. to prevent the leakage of the electrolyte}

H01G 9/2081 . . . { Serial interconnection of cells}

H01G 9/2086 . . . { Photoelectrochemical cells in the form of a fiber}

H01G 9/209 . . { Light trapping arrangements}

- H01G 9/2095 . . {comprising a flexible substrate}
- H01G 9/21 . Temperature-sensitive devices
- H01G 9/22 . Devices using combined reduction and oxidation, e.g. redox arrangement or solion
- H01G 9/26 . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices with each other
- H01G 9/28 . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices with other electric components not covered by this subclass
- H01G 11/00** **Hybrid capacitors, i.e. capacitors having different positive and negative electrodes; Electric double-layer [EDL] capacitors [EDLCs]; Processes specially adapted for the manufacture thereof or of parts thereof**
- NOTE**
- Group [H01G 11/02](#) takes precedence over groups [H01G 11/04](#) - [H01G 11/14](#)
- WARNING**
- Groups [H01G 11/00](#) to 11/86 correspond to IPC 2013.01. Concordance CPC - IPC 2012.01 for these groups is as follows: - [H01G 11/00](#) : [H01G 9/155](#) - [H01G 11/02](#) : [H01G 9/28](#); - [H01G 11/04](#) - 11/20: [H01G 9/155](#); - [H01G 11/22](#) - 11/50: [H01G 9/058](#); - [H01G 11/52](#) : [H01G 9/155](#); - [H01G 11/54](#) - 11/64 : [H01G 9/038](#); - [H01G 11/66](#) - 11/76 : [H01G 9/016](#); - [H01G 11/78](#) - 11/84 : [H01G 9/155](#); - [H01G 11/86](#) : [H01G 9/058](#)
- H01G 11/02 . using combined reduction-oxidation reactions, e.g. redox arrangement or solion
- H01G 11/04 . Hybrid capacitors
- H01G 11/06 . . with one of the electrodes allowing ions or anions to be reversibly doped thereinto, e.g. lithium-ion capacitors [LICs]
- H01G 11/08 . Structural combinations, e.g. assembly or connection, of hybrid or EDL capacitors with other electric components, at least one hybrid or EDL capacitor being the main component
- H01G 11/10 . Multiple hybrid or EDL capacitors, e.g. arrays or modules ( [housings, cases or mountings thereof H01G 11/78](#))
- H01G 11/12 . . Stacked hybrid or EDL capacitors
- H01G 11/14 . Arrangements or processes for adjusting or protecting hybrid or EDL capacitors ([emergency protective circuit arrangements specially adapted for capacitors, and effecting automatic switching in the event of an undesired change from normal working conditions H02H 7/16](#); [emergency protective circuit arrangements for limiting excess current or voltages without disconnection H02H 9/00](#))
- H01G 11/16 . . against electric overloads, e.g. including fuses
- H01G 11/18 . . against thermal overloads, e.g. heating, cooling or ventilating
- H01G 11/20 . . Reformation or processes for removal of impurities, e.g. scavenging
- H01G 11/22 . Electrodes

- H01G 11/24 . . characterised by structural features, e.g. forms, shapes, surface areas, porosities or dimensions, of the materials making up or comprised in the electrodes; characterised by the structural features of powders or particles used therefor
- H01G 11/26 . . characterised by the structures of the electrodes, e.g. multi-layered, shapes, dimensions, porosities or surface features
- H01G 11/28 . . . . arranged or disposed on a current collector; Layers or phases between electrodes and current collectors, e.g. adhesives
- H01G 11/30 . . characterised by their materials
- H01G 11/32 . . . . Carbon-based, e.g. activated carbon materials
- H01G 11/34 . . . . . characterised by carbonisation or activation of carbon
- H01G 11/36 . . . . . Nanostructures, e.g. nanofibres, nanotubes or fullerenes
- H01G 11/38 . . . . . Carbon pastes or blends; Binders or additives therein
- H01G 11/40 . . . . . Fibres
- H01G 11/42 . . . . . Powders or particles, e.g. composition thereof
- H01G 11/44 . . . . . Raw materials therefor, e.g. resins or coal
- H01G 11/46 . . . . Metal oxides, e.g. ruthenium oxide
- H01G 11/48 . . . . Conductive polymers
- H01G 11/50 . . . . specially adapted for lithium-ion capacitors, e.g. for lithium-doping or for intercalation
  
- H01G 11/52 . . Separators
  
- H01G 11/54 . . Electrolytes
- H01G 11/56 . . . . Solid electrolytes, e.g. gel; Additives therein
- H01G 11/58 . . . . Liquid electrolytes
- H01G 11/60 . . . . . characterised by the solvent
- H01G 11/62 . . . . . characterised by the solute, e.g. salts, anions or cations therein
- H01G 11/64 . . . . . characterised by additives
  
- H01G 11/66 . . Current collectors
- H01G 11/68 . . . . characterised by their materials
- H01G 11/70 . . . . characterised by their structures
- H01G 11/72 . . . . specially adapted for integration in multiple or stacked hybrid or EDL capacitors
  
- H01G 11/74 . . Terminals, e.g. extensions of current collectors
- H01G 11/76 . . . . specially adapted for integration in multiple or stacked hybrid or EDL capacitors
  
- H01G 11/78 . . Cases; Housings; Encapsulations; Mountings
- H01G 11/80 . . . . Gaskets; Sealings
- H01G 11/82 . . . . Fixing or assembling a capacitive element in a housing, e.g. mounting electrodes, current collectors or terminals in containers or encapsulations
- H01G 11/84 . . . . Processes for the manufacture of hybrid or EDL capacitors, or components thereof
- H01G 11/86 . . . . specially adapted for electrodes ([carbonization or activation of carbon for the manufacture of electrodes H01G 11/34](#))
  
- H01G 13/00 . . . . . Apparatus specially adapted for manufacturing capacitors; Processes specially**



**adapted for manufacturing capacitors not provided for in groups [H01G 4/00](#) to [H01G 11/00](#)**

- [H01G 13/003](#) . {Apparatus or processes for encapsulating capacitors}
- [H01G 13/006](#) . {Apparatus or processes for applying terminals}
- [H01G 13/02](#) . Machines for winding capacitors ([winding in general B65H](#))
- [H01G 13/04](#) . Drying ([in general F26B](#)); Impregnating
- [H01G 13/06](#) . with provision of removing metal surfaces
  
- [H01G 15/00](#)** **Structural combinations of capacitors or other devices covered by at least two different main groups of this subclass with each other ([involving at least one hybrid or electric double-layer \[EDL\] capacitor as main component H01G 11/08](#))**
  
- [H01G 17/00](#)** **Structural combinations of capacitors or other devices covered by at least two different main groups of this subclass with other electric elements, not covered by this subclass, e.g. RC combinations ([thin- or thick-film circuits H01L 27/00](#); RC-filters [H03H](#))**
  
  
- [H01G 2004/00](#)** **Fixed capacitors; Processes of their manufacture ([electrolytic capacitors H01G 9/00](#))**
  
- [H01G 2004/06](#) . Solid dielectrics
- [H01G 2004/24](#) . . [D0608]
  
- [H01G 2005/00](#)** **Capacitors in which the capacitance is varied by mechanical means, e.g. by turning a shaft; Processes of their manufacture**
  
- [H01G 2005/02](#) . IPC5 having air, gas, or vacuum as the dielectric
  
- [H01G 2009/00](#)** **Electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices; Processes of their manufacture**
  
- [H01G 2009/0007](#) . Double layer capacitors
- [H01G 2009/001](#) . Temperature sensitive devices
- [H01G 2009/0014](#) . Solid electrolytic capacitors
- [H01G 2009/0018](#) . . with wound foil electrodes
- [H01G 2009/0021](#) . . Skin fibre
- [H01G 2009/0025](#) . Liquid electrolytic capacitors

- H01G 2009/04 . Electrodes { or formation of dielectric layers thereon}
- H01G 2009/0404 . . characterised by the material (alloys in general see C22C)
- H01G 2009/0408 . . . on Al basis
- H01G 2009/0412 . . characterised by the structure
- H01G 2009/0416 . . . Etched foil electrodes (etching of metal in general C23F; electro-etching of metal in general C25F)
- H01G 2009/048 . . characterised by their structure ([H01G 11/22](#) takes precedence)
- H01G 2009/05 . . IPC5 consisting of tantalum, niobium, or sintered material; Combinations of such electrodes with solid semiconductive electrolytes, e.g. manganese dioxide not used, see subgroups and [H01G 9/00F](#), [H01G 9/04B](#)
- H01G 2009/0503 . . . characterised by the material
- H01G 2009/0506 . . . specially adapted for cathode
- H01G 2009/0509 . . . characterised by the structure
- H01G 2009/0513 . . . sintered
- H01G 2009/0516 . . . . Powder therefor (metallic powder in general B22F)