

CPC COOPERATIVE PATENT CLASSIFICATION

H ELECTRICITY

(NOTE omitted)

H01 BASIC ELECTRIC ELEMENTS

(NOTE omitted)

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](#)})

WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

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| 2/00 | Details of capacitors not covered by a single one of groups H01G 4/00-H01G 11/00 | 4/105 | {Glass dielectric} |
| 2/02 | . Mountings | 4/12 | Ceramic dielectrics {(H01G 4/085 takes precedence; ceramic materials per se C04B 35/00)} |
| 2/04 | . . specially adapted for mounting on a chassis | | |
| 2/06 | . . specially adapted for mounting on a printed-circuit support | 4/1209 | {characterised by the ceramic dielectric material (H01G 4/1272 , H01G 4/1281 take precedence)} |
| 2/065 | . . . {for surface mounting, e.g. chip capacitors} | | |
| 2/08 | . Cooling arrangements; Heating arrangements; Ventilating arrangements | 4/1218 | {based on titanium oxides or titanates (H01G 4/1245 takes precedence)} |
| 2/10 | . Housing; Encapsulation | 4/1227 | {based on alkaline earth titanates} |
| | WARNING | 4/1236 | {based on zirconium oxides or zirconates (H01G 4/1263 takes precedence)} |
| | Not complete, see also H01G 4/224 | | |
| 2/103 | . . {Sealings, e.g. for lead-in wires; Covers} | 4/1245 | {containing also titanates} |
| 2/106 | . . {Fixing the capacitor in a housing} | 4/1254 | {based on niobium or tungsten, tantalum oxides or niobates, tantalates} |
| 2/12 | . Protection against corrosion (H01G 2/10 takes precedence) | 4/1263 | {containing also zirconium oxides or zirconates} |
| 2/14 | . Protection against electric or thermal overload (by cooling H01G 2/08) | 4/1272 | {Semiconductive ceramic capacitors} |
| 2/16 | . . with fusing elements | 4/1281 | {with grain boundary layer} |
| 2/18 | . . with breakable contacts | 4/129 | {containing a glassy phase, e.g. glass ceramic} |
| 2/20 | . Arrangements for preventing discharge from edges of electrodes | 4/14 | Organic dielectrics |
| 2/22 | . Electrostatic or magnetic shielding | 4/145 | {vapour deposited} |
| 2/24 | . Distinguishing marks, e.g. colour coding | 4/16 | of fibrous material, e.g. paper |
| 4/00 | Fixed capacitors; Processes of their manufacture (electrolytic capacitors H01G 9/00) | 4/18 | of synthetic material, e.g. derivatives of cellulose (H01G 4/16 takes precedence) |
| 4/002 | . Details | 4/183 | {Derivatives of cellulose (H01G 4/145 takes precedence)} |
| 4/005 | . . Electrodes | 4/186 | {halogenated (H01G 4/145 takes precedence)} |
| 4/008 | . . . Selection of materials | | |
| 4/0085 | {Fried electrodes} | 4/20 | . . . using combinations of dielectrics from more than one of groups H01G 4/02 - H01G 4/06 (H01G 4/12 takes precedence) |
| 4/01 | . . . Form of self-supporting electrodes | | |
| 4/012 | . . . Form of non-self-supporting electrodes | 4/203 | {Fibrous material or synthetic material} |
| 4/015 | . . . Special provisions for self-healing | 4/206 | {inorganic and synthetic material} |
| 4/018 | . . Dielectrics | 4/22 | impregnated |
| 4/02 | . . . Gas or vapour dielectrics | 4/221 | {characterised by the composition of the impregnant} |
| 4/04 | . . . Liquid dielectrics | | |
| 4/06 | . . . Solid dielectrics | 4/222 | {halogenated} |
| 4/08 | Inorganic dielectrics | 4/224 | . . Housing; Encapsulation |
| 4/085 | {Vapour deposited} | 4/228 | . . Terminals |
| 4/10 | Metal-oxide dielectrics {(H01G 4/085 takes precedence)} | | |

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| 4/232 | . . . electrically connecting two or more layers of a stacked or rolled capacitor | 5/10 | . . . due to rotation of helical electrodes |
| 4/2325 | {characterised by the material of the terminals} | 5/12 | . . . due to rotation of part-cylindrical, conical, or spherical electrodes |
| 4/236 | . . . leading through the housing, i.e. lead-through | 5/14 | . . . due to longitudinal movement of electrodes |
| 4/242 | . . . the capacitive element surrounding the terminal | 5/145 | . . . {with profiled electrodes} |
| 4/245 | Tabs between the layers of a rolled electrode | 5/16 | . . . using variation of distance between electrodes |
| 4/248 | . . . the terminals embracing or surrounding the capacitive element, e.g. caps (H01G 4/252 takes precedence) | 5/18 | . . . due to change in inclination, e.g. by flexing, by spiral wrapping |
| 4/252 | . . . the terminals being coated on the capacitive element (H01G 4/232 takes precedence) | 5/38 | . . . Multiple capacitors, e.g. ganged |
| 4/255 | . . Means for correcting the capacitance value | 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) |
| 4/258 | . . Temperature compensation means | 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) |
| 4/26 | . . Folded capacitors | 7/02 | . . Electrets, i.e. having a permanently-polarised dielectric |
| 4/28 | . . Tubular capacitors | 7/021 | . . . {having an organic dielectric} |
| 4/30 | . . Stacked capacitors (H01G 4/33 takes precedence) | 7/023 | {of macromolecular compounds} |
| 4/302 | . . . {obtained by injection of metal in cavities formed in a ceramic body} | 7/025 | . . . {having an inorganic dielectric} |
| 4/304 | . . . {obtained from another capacitor} | 7/026 | {with ceramic dielectric} |
| 4/306 | . . . {made by thin film techniques} | 7/028 | . . . {having a heterogeneous dielectric} |
| 4/308 | . . . {made by transfer techniques} | 7/04 | . . . having a dielectric selected for the variation of its permittivity with applied temperature |
| 4/32 | . . Wound capacitors | 7/06 | . . . having a dielectric selected for the variation of its permittivity with applied voltage, i.e. ferroelectric capacitors (electrets H01G 7/02) |
| 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}) | 9/00 | Electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices; Processes of their manufacture |
| 4/35 | . . Feed-through capacitors or anti-noise capacitors | 9/0003 | . . {Protection against electric or thermal overload; cooling arrangements; means for avoiding the formation of cathode films (H01G 9/12 takes precedence)} |
| 4/38 | . . Multiple capacitors, i.e. structural combinations of fixed capacitors | 2009/0007 | . . . {Double layer capacitors} |
| 4/385 | . . . {Single unit multiple capacitors, e.g. dual capacitor in one coil} | 2009/001 | . . . {Temperature sensitive devices} |
| 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}) | 2009/0014 | . . . {Solid electrolytic capacitors} |
| 5/00 | Capacitors in which the capacitance is varied by mechanical means, e.g. by turning a shaft; Processes of their manufacture | 2009/0018 | {with wound foil electrodes} |
| 5/01 | . . Details | 2009/0021 | {Skin fibre} |
| 5/011 | . . . Electrodes | 2009/0025 | . . . {Liquid electrolytic capacitors} |
| 5/012 | at least one of the electrodes being a displaceable liquid or powder | 9/0029 | . . . {Processes of manufacture} |
| 5/013 | . . . Dielectrics | 9/0032 | {formation of the dielectric layer (anodisation in general C25D)} |
| 5/0132 | {Liquid dielectrics} | 9/0036 | {Formation of the solid electrolyte layer} |
| 5/0134 | {Solid dielectrics} | 9/004 | . . . Details |
| 5/0136 | {with movable electrodes} | 9/008 | . . . Terminals |
| 5/0138 | {with movable dielectrics} | 9/012 | specially adapted for solid capacitors |
| 5/014 | . . . Housing; Encapsulation | 9/016 | {specially adapted for double-layer capacitors} |
| 5/015 | . . . Current collectors | 9/02 | . . . Diaphragms; Separators |
| 5/017 | . . . Temperature compensation | 9/022 | . . . Electrolytes, absorbents (electrolytic or electrophoretic processes, apparatus therefor C25; for primary, secondary or fuel cells H01M) |
| 5/019 | . . . Means for correcting the capacitance characteristics | 9/025 | Solid electrolytes (H01G 11/54 takes precedence) |
| 2005/02 | . . {IPC5 having air, gas, or vacuum as the dielectric} | 9/028 | Organic semiconducting electrolytes, e.g. TCNQ |
| 5/04 | . . . using variation of effective area of electrode | 9/032 | Inorganic semiconducting electrolytes, e.g. MnO ₂ |
| 5/06 | . . . due to rotation of flat or substantially flat electrodes | 9/035 | Liquid electrolytes, e.g. impregnating materials (H01G 11/54 takes precedence) |
| 5/08 | . . . becoming active in succession | | |

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| 9/038 | . . . {Electrolytes specially adapted for double-layer capacitors} | 9/155 | . {Double-layer capacitors} |
| | WARNING | | 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 | | 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 |
| 9/04 | . . Electrodes {or formation of dielectric layers thereon} | 9/16 | . specially for use as rectifiers or detectors (H01G 9/22 takes precedence) |
| 2009/0404 | . . . {characterised by the material (alloys in general see C22C)} | 9/18 | . Self-interrupters |
| 2009/0408 | {on Al basis} | 9/20 | . Light-sensitive devices |
| 2009/0412 | . . . {characterised by the structure} | 9/2004 | . . {characterised by the electrolyte, e.g. comprising an organic electrolyte} |
| 2009/0416 | {Etched foil electrodes (etching of metal in general C23F ; electro-etching of metal in general C25F)} | 9/2009 | . . . {Solid electrolytes} |
| 9/042 | . . . characterised by the material (H01G 11/22 takes precedence) | 9/2013 | . . . {the electrolyte comprising ionic liquids, e.g. alkyl imidazolium iodide} |
| 9/0425 | {specially adapted for cathode} | 9/2018 | . . . {characterised by the ionic charge transport species, e.g. redox shuttles} |
| 9/045 | based on aluminium | 9/2022 | . . {characterized by he counter electrode} |
| 9/048 | . . . characterised by their structure (H01G 11/22 takes precedence) | 9/2027 | . . {comprising an oxide semiconductor electrode} |
| 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} | 9/2031 | . . . {comprising titanium oxide, e.g. TiO ₂ (H01G 9/2036 takes precedence)} |
| 9/052 | Sintered electrodes | 9/2036 | . . . {comprising mixed oxides, e.g. ZnO covered TiO ₂ particles} |
| 9/0525 | {Powder therefor (metallic powder in general B22F)} | 9/204 | . . . {comprising zinc oxides, e.g. ZnO (H01G 9/2036 takes precedence)} |
| 9/055 | Etched foil electrodes | 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} |
| 9/058 | . . . {specially adapted for double-layer capacitors} | 9/205 | . . {comprising a semiconductor electrode comprising AIII-BV compounds with or without impurities, e.g. doping materials} |
| | WARNING | 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)} |
| | 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 | 9/2059 | . . {comprising an organic dye as the active light absorbing material, e.g. adsorbed on an electrode or dissolved in solution} |
| 9/06 | . . . Mounting in containers | 9/2063 | . . . {comprising a mixture of two or more dyes} |
| | WARNING | 9/2068 | . . {Panels or arrays of photoelectrochemical cells, e.g. photovoltaic modules based on photoelectrochemical cells} |
| | 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 | 9/2072 | . . . {comprising two or more photoelectrodes sensible to different parts of the solar spectrum, e.g. tandem cells} |
| 9/07 | . . Dielectric layers | 9/2077 | . . . {Sealing arrangements, e.g. to prevent the leakage of the electrolyte} |
| 9/08 | . . Housing; Encapsulation | 9/2081 | . . . {Serial interconnection of cells} |
| 9/10 | . . . Sealing, e.g. of lead-in wires | 9/2086 | . . . {Photoelectrochemical cells in the form of a fiber} |
| 9/12 | . . . Vents or other means allowing expansion | 9/209 | . . {Light trapping arrangements} |
| 9/14 | . . Structural combinations {or circuits} for modifying, or compensating for, electric characteristics of electrolytic capacitors (impedance networks H03H) | 9/2095 | . . {comprising a flexible sustrate} |
| 9/145 | . Liquid electrolytic capacitors (H01G 11/00 takes precedence) | 9/21 | . Temperature-sensitive devices |
| 9/15 | . Solid electrolytic capacitors (H01G 11/00 takes precedence) | 9/22 | . Devices using combined reduction and oxidation, e.g. redox arrangement or solion |
| 9/151 | . . {with wound foil electrodes} | 9/26 | . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices with each other |
| 9/153 | . . {Skin fibre} | | |

- 9/28 . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices with other electric components not covered by this subclass
- 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](#)
- 11/02 . using combined reduction-oxidation reactions, e.g. redox arrangement or solion
- 11/04 . Hybrid capacitors
- 11/06 . . with one of the electrodes allowing ions or anions to be reversibly doped therein, e.g. lithium-ion capacitors [LICs]
- 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
- 11/10 . Multiple hybrid or EDL capacitors, e.g. arrays or modules ([housings, cases or mountings thereof H01G 11/78](#))
- 11/12 . . Stacked hybrid or EDL capacitors
- 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](#))
- 11/16 . . against electric overloads, e.g. including fuses
- 11/18 . . against thermal overloads, e.g. heating, cooling or ventilating
- 11/20 . . Reformation or processes for removal of impurities, e.g. scavenging
- 11/22 . Electrodes
- 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
- 11/26 . . characterised by the structures of the electrodes, e.g. multi-layered, shapes, dimensions, porosities or surface features
- 11/28 . . . arranged or disposed on a current collector; Layers or phases between electrodes and current collectors, e.g. adhesives
- 11/30 . . characterised by their materials
- 11/32 . . . Carbon-based, e.g. activated carbon materials
- 11/34 characterised by carbonisation or activation of carbon
- 11/36 Nanostructures, e.g. nanofibres, nanotubes or fullerenes
- 11/38 Carbon pastes or blends; Binders or additives therein
- 11/40 Fibres
- 11/42 Powders or particles, e.g. composition thereof
- 11/44 Raw materials therefor, e.g. resins or coal
- 11/46 . . . Metal oxides, e.g. ruthenium oxide
- 11/48 . . . Conductive polymers
- 11/50 . . . specially adapted for lithium-ion capacitors, e.g. for lithium-doping or for intercalation
- 11/52 . Separators
- 11/54 . Electrolytes
- 11/56 . . Solid electrolytes, e.g. gels; Additives therein
- 11/58 . . Liquid electrolytes
- 11/60 . . . characterised by the solvent
- 11/62 . . . characterised by the solute, e.g. salts, anions or cations therein
- 11/64 . . . characterised by additives
- 11/66 . Current collectors
- 11/68 . . characterised by their materials
- 11/70 . . characterised by their structures
- 11/72 . . specially adapted for integration in multiple or stacked hybrid or EDL capacitors
- 11/74 . Terminals, e.g. extensions of current collectors
- 11/76 . . specially adapted for integration in multiple or stacked hybrid or EDL capacitors
- 11/78 . Cases; Housings; Encapsulations; Mountings
- 11/80 . . Gaskets; Sealings
- 11/82 . . Fixing or assembling a capacitive element in a housing, e.g. mounting electrodes, current collectors or terminals in containers or encapsulations
- 11/84 . Processes for the manufacture of hybrid or EDL capacitors, or components thereof
- 11/86 . . specially adapted for electrodes ([carbonisation or activation of carbon for the manufacture of electrodes H01G 11/34](#))
- 13/00 Apparatus specially adapted for manufacturing capacitors; Processes specially adapted for manufacturing capacitors not provided for in groups [H01G 4/00](#) - [H01G 11/00](#)**
- 13/003 . {Apparatus or processes for encapsulating capacitors}
- 13/006 . {Apparatus or processes for applying terminals}
- 13/02 . Machines for winding capacitors ([winding in general B65H](#))
- 13/04 . Drying ([in general F26B](#)); Impregnating
- 13/06 . with provision for removing metal surfaces
- 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](#))**
- 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](#))**