

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](#)})

2/00	Details of capacitors not covered by a single one of groups H01G 4/00-H01G 11/00	4/1236	. . . . . {based on zirconium oxides or zirconates (H01G 4/1263 takes precedence)}
2/02	. Mountings		
2/04	. . specially adapted for mounting on a chassis	4/1245	. . . . . {containing also titanates}
2/06	. . specially adapted for mounting on a printed-circuit support	4/1254	. . . . . {based on niobium or tungsten, tantalum oxides or niobates, tantalates}
2/065	. . . {for surface mounting, e.g. chip capacitors}		
2/08	. Cooling arrangements; Heating arrangements; Ventilating arrangements	4/1263	. . . . . {containing also zirconium oxides or zirconates}
2/10	. Housing; Encapsulation	4/1272	. . . . . {Semiconductive ceramic capacitors}
	<u>WARNING</u>	4/1281	. . . . . {with grain boundary layer}
	Not complete, see also H01G 4/224	4/129	. . . . . {containing a glassy phase, e.g. glass ceramic}
		4/14	. . . . Organic dielectrics
2/103	. . {Sealings, e.g. for lead-in wires; Covers}	4/145	. . . . {vapour deposited}
2/106	. . {Fixing the capacitor in a housing}	4/16	. . . . of fibrous material, e.g. paper
2/12	. Protection against corrosion (H01G 2/10 takes precedence)	4/18	. . . . of synthetic material, e.g. derivatives of cellulose (H01G 4/16 takes precedence)
2/14	. Protection against electric or thermal overload (by cooling H01G 2/08)	4/183	. . . . . {Derivatives of cellulose (H01G 4/145 takes precedence)}
2/16	. . with fusing elements	4/186	. . . . . {halogenated (H01G 4/145 takes precedence)}
2/18	. . with breakable contacts		
2/20	. Arrangements for preventing discharge from edges of electrodes	4/20	. . . using combinations of dielectrics from more than one of groups H01G 4/02 - H01G 4/06 (H01G 4/12 takes precedence)
2/22	. Electrostatic or magnetic shielding	4/203	. . . . {Fibrous material or synthetic material}
2/24	. Distinguishing marks, e.g. colour coding	4/206	. . . . {inorganic and synthetic material}
4/00	Fixed capacitors; Processes of their manufacture (electrolytic capacitors H01G 9/00)	4/22	. . . . impregnated
4/002	. Details	4/221	. . . . . {characterised by the composition of the impregnant}
4/005	. . Electrodes		
4/008	. . . Selection of materials	4/222	. . . . . {halogenated}
4/0085	. . . . {Fried electrodes}	4/224	. . Housing; Encapsulation
4/01	. . . Form of self-supporting electrodes	4/228	. . Terminals
4/012	. . . Form of non-self-supporting electrodes	4/232	. . . electrically connecting two or more layers of a stacked or rolled capacitor
4/015	. . . Special provisions for self-healing		
4/018	. . Dielectrics	4/2325	. . . . {characterised by the material of the terminals}
4/02	. . . Gas or vapour dielectrics	4/236	. . . leading through the housing, i.e. lead-through
4/04	. . . Liquid dielectrics	4/242	. . . the capacitive element surrounding the terminal
4/06	. . . Solid dielectrics	4/245	. . . . Tabs between the layers of a rolled electrode
4/08	. . . . Inorganic dielectrics	4/248	. . . the terminals embracing or surrounding the capacitive element, e.g. caps (H01G 4/252 takes precedence)
4/085	. . . . . {Vapour deposited}		
4/10	. . . . . Metal-oxide dielectrics {(H01G 4/085 takes precedence)}	4/252	. . . the terminals being coated on the capacitive element (H01G 4/232 takes precedence)
4/105	. . . . . {Glass dielectric}	4/255	. . Means for correcting the capacitance value
4/12	. . . . . Ceramic dielectrics {(H01G 4/085 takes precedence; ceramic materials per se C04B 35/00)}	4/258	. . Temperature compensation means
4/1209	. . . . . {characterised by the ceramic dielectric material (H01G 4/1272 , H01G 4/1281 take precedence)}	4/26	. Folded capacitors
		4/28	. Tubular capacitors
4/1218	. . . . . {based on titanium oxides or titanates (H01G 4/1245 takes precedence)}	4/30	. Stacked capacitors (H01G 4/33 takes precedence)
		4/302	. . {obtained by injection of metal in cavities formed in a ceramic body}
4/1227	. . . . . {based on alkaline earth titanates}	4/304	. . {obtained from a another capacitor}
		4/306	. . {made by thin film techniques}

4/308	. . {made by transfer techniques}	7/023	. . . {of macromolecular compounds}
4/32	. Wound capacitors	7/025	. . {having an inorganic dielectric}
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 })	7/026	. . . {with ceramic dielectric}
4/35	. Feed-through capacitors or anti-noise capacitors	7/028	. . {having a heterogeneous dielectric}
4/38	. Multiple capacitors, i.e. structural combinations of fixed capacitors	7/04	. having a dielectric selected for the variation of its permittivity with applied temperature
4/385	. . {Single unit multiple capacitors, e.g. dual capacitor in one coil}	7/06	. having a dielectric selected for the variation of its permittivity with applied voltage, i.e. ferroelectric capacitors (electrets H01G 7/02)
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 })	9/00	Electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices; Processes of their manufacture
5/00	Capacitors in which the capacitance is varied by mechanical means, e.g. by turning a shaft; Processes of their manufacture	9/0003	. {Protection against electric or thermal overload; cooling arrangements; means for avoiding the formation of cathode films (H01G 9/12 takes precedence)}
5/01	. Details	2009/0007	. {Double layer capacitors}
5/011	. . Electrodes	2009/001	. {Temperature sensitive devices}
5/012	. . . at least one of the electrodes being a displaceable liquid or powder	2009/0014	. {Solid electrolytic capacitors}
5/013	. . Dielectrics	2009/0018	. . {with wound foil electrodes}
5/0132	. . . {Liquid dielectrics}	2009/0021	. . {Skin fibre}
5/0134	. . . {Solid dielectrics}	2009/0025	. {Liquid electrolytic capacitors}
5/0136	. . . . {with movable electrodes}	9/0029	. {Processes of manufacture}
5/0138	. . . . {with movable dielectrics}	9/0032	. . {formation of the dielectric layer (anodisation in general C25D)}
5/014	. . Housing; Encapsulation	9/0036	. . {Formation of the solid electrolyte layer}
5/015	. . Current collectors	9/004	. Details
5/017	. . Temperature compensation	9/008	. . Terminals
5/019	. . Means for correcting the capacitance characteristics	9/012	. . . specially adapted for solid capacitors
2005/02	. {IPC5 having air, gas, or vacuum as the dielectric}	9/016	. . . {specially adapted for double-layer capacitors}
5/04	. using variation of effective area of electrode	9/02	. . Diaphragms; Separators
5/06	. . due to rotation of flat or substantially flat electrodes	9/022	. . Electrolytes, absorbents (electrolytic or electrophoretic processes, apparatus therefor C25; for primary, secondary or fuel cells H01M)
5/08	. . . becoming active in succession	9/025	. . . Solid electrolytes (H01G 11/54 takes precedence)
5/10	. . due to rotation of helical electrodes	9/028	. . . . Organic semiconducting electrolytes, e.g. TCNQ
5/12	. . due to rotation of part-cylindrical, conical, or spherical electrodes	9/032	. . . . Inorganic semiconducting electrolytes, e.g. MnO ₂
5/14	. . due to longitudinal movement of electrodes	9/035	. . . Liquid electrolytes, e.g. impregnating materials (H01G 11/54 takes precedence)
5/145	. . . {with profiled electrodes}	9/038	. . . {Electrolytes specially adapted for double-layer capacitors}
5/16	. using variation of distance between electrodes	WARNING	
5/18	. . due to change in inclination, e.g. by flexing, by spiral wrapping	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	
5/38	. Multiple capacitors, e.g. ganged	9/04	. . Electrodes {or formation of dielectric layers thereon}
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)	2009/0404	. . . {characterised by the material (alloys in general see C22C)}
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)	2009/0408	. . . . {on Al basis}
7/02	. Electrets, i.e. having a permanently-polarised dielectric	2009/0412	. . . {characterised by the structure}
7/021	. . {having an organic dielectric}	2009/0416	. . . . {Etched foil electrodes (etching of metal in general C23F ; electro-etching of metal in general C25F)}
		9/042	. . . characterised by the material (H01G 11/22 takes precedence)

- 9/0425 . . . {specially adapted for cathode}
- 9/045 . . . based on aluminium
- 9/048 . . . characterised by their structure ([H01G 11/22 takes precedence](#))
- 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}
- 9/052 . . . Sintered electrodes
- 9/0525 . . . {Powder therefor ([metallic powder in general B22F](#))}
- 9/055 . . . Etched foil electrodes
- 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](#)

- 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](#)

- 9/07 . . Dielectric layers
- 9/08 . . Housing; Encapsulation
- 9/10 . . . Sealing, e.g. of lead-in wires
- 9/12 . . . Vents or other means allowing expansion
- 9/14 . . Structural combinations {or circuits} for modifying, or compensating for, electric characteristics of electrolytic capacitors ([impedance networks H03H](#))
- 9/145 . Liquid electrolytic capacitors ([H01G 11/00 takes precedence](#))
- 9/15 . Solid electrolytic capacitors ([H01G 11/00 takes precedence](#))
- 9/151 . . {with wound foil electrodes}
- 9/153 . . {Skin fibre}
- 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

- 9/16 . specially for use as rectifiers or detectors ([H01G 9/22 takes precedence](#))
- 9/18 . Self-interrupters
- 9/20 . Light-sensitive devices
- 9/2004 . . {characterised by the electrolyte, e.g. comprising an organic electrolyte}
- 9/2009 . . . {Solid electrolytes}
- 9/2013 . . . {the electrolyte comprising ionic liquids, e.g. alkyl imidazolium iodide}
- 9/2018 . . . {characterised by the ionic charge transport species, e.g. redox shuttles}
- 9/2022 . . {characterized by the counter electrode}

- 9/2027 . . {comprising an oxide semiconductor electrode}
- 9/2031 . . . {comprising titanium oxide, e.g. TiO₂ ([H01G 9/2036 takes precedence](#))}
- 9/2036 . . . {comprising mixed oxides, e.g. ZnO covered TiO₂ particles}
- 9/204 . . . {comprising zinc oxides, e.g. ZnO ([H01G 9/2036 takes precedence](#))}
- 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}
- 9/205 . . {comprising a semiconductor electrode comprising AIII-BV compounds with or without impurities, e.g. doping materials}
- 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](#))}
- 9/2059 . . {comprising an organic dye as the active light absorbing material, e.g. adsorbed on an electrode or dissolved in solution}
- 9/2063 . . . {comprising a mixture of two or more dyes}
- 9/2068 . . {Panels or arrays of photoelectrochemical cells, e.g. photovoltaic modules based on photoelectrochemical cells}
- 9/2072 . . . {comprising two or more photoelectrodes sensible to different parts of the solar spectrum, e.g. tandem cells}
- 9/2077 . . . {Sealing arrangements, e.g. to prevent the leakage of the electrolyte}
- 9/2081 . . . {Serial interconnection of cells}
- 9/2086 . . . {Photoelectrochemical cells in the form of a fiber}
- 9/209 . . {Light trapping arrangements}
- 9/2095 . . {comprising a flexible substrate}
- 9/21 . Temperature-sensitive devices
- 9/22 . Devices using combined reduction and oxidation, e.g. redox arrangement or solion
- 9/26 . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices with each other
- 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 thereinto, 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. gel; 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 ([carbonization 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 of 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](#))**