

CPC COOPERATIVE PATENT CLASSIFICATION

H ELECTRICITY

(NOTE omitted)

H10 SEMICONDUCTOR DEVICES; ELECTRIC SOLID-STATE DEVICES NOT OTHERWISE PROVIDED FOR

H10K ORGANIC ELECTRIC SOLID-STATE DEVICES

NOTES

1. This subclass covers:
 - individual organic electric solid-state devices, i.e. electric solid-state devices comprising organic material in the active part;
 - integrated devices, or assemblies of multiple devices, comprising such elements.
2. This subclass does not cover:
 - organic electronic memory devices, which are covered by subclass [H10B](#);
 - organic thermoelectric devices, organic thermomagnetic devices, organic piezoelectric devices, organic electrostrictive devices, organic magnetostrictive devices, organic galvanomagnetic devices, organic Hall-effect devices, organic superconducting devices or organic solid-state devices having no potential barriers, and specially adapted for rectifying, amplifying, oscillating or switching, which are covered by subclass [H10N](#);
 - organic resistors having no potential barriers and not specially adapted for integrated devices, which are covered by subclass [H01C](#);
 - organic capacitors having no potential barriers and not specially adapted for integrated devices, which are covered by subclass [H01G](#).
3. In this subclass, the periodic system used is the I to VIII group system indicated in the Periodic Table under Note (3) of section [C](#).
4. In this subclass, it is desirable to add the indexing codes of groups [\(H10K 2101/00 - H10K 2102/00\)](#).

Organic devices specially adapted for rectifying, amplifying, oscillating or switching

10/00 Organic devices specially adapted for rectifying, amplifying, oscillating or switching; Organic capacitors or resistors having potential barriers (integrated devices or assemblies of multiple devices [H10K 19/00](#))

10/10 . Organic capacitors or resistors having potential barriers

10/20 . Organic diodes

10/23 . . Schottky diodes

10/26 . . Diodes comprising organic-organic junctions

10/29 . . Diodes comprising organic-inorganic heterojunctions

10/40 . Organic transistors

10/43 . . Bipolar transistors, e.g. organic bipolar junction transistors [OBT]

10/46 . . Field-effect transistors, e.g. organic thin-film transistors [OTFT] ([H10K 10/43](#) takes precedence)

10/462 . . . {Insulated gate field-effect transistors [IGFETs]}

10/464 {Lateral top-gate IGFETs comprising only a single gate}

10/466 {Lateral bottom-gate IGFETs comprising only a single gate}

10/468 {characterised by the gate dielectrics}

10/471 {the gate dielectric comprising only organic materials}

10/472 {the gate dielectric comprising only inorganic materials}

10/474 {the gate dielectric comprising a multilayered structure}

10/476 {comprising at least one organic layer and at least one inorganic layer}

10/478 {the gate dielectric comprising a layer of composite material comprising interpenetrating or embedded materials, e.g. TiO₂ particles in a polymer matrix}

10/481 {characterised by the gate conductors}

10/482 {the IGFET comprising multiple separately-addressable gate electrodes}

10/484 {characterised by the channel regions}

10/486 {the channel region comprising two or more active layers, e.g. forming pn heterojunctions}

10/488 {the channel region comprising a layer of composite material having interpenetrating or embedded materials, e.g. a mixture of donor and acceptor moieties, that form a bulk heterojunction}

10/491 {Vertical transistors, e.g. vertical carbon nanotube field effect transistors [CNT-FETs]}

10/50 . Bistable switching devices

10/701 . {Organic molecular electronic devices}

10/80 . Constructional details

10/82 . . Electrodes

10/84 . . . Ohmic electrodes, e.g. source or drain electrodes

10/86 . . . Schottky electrodes

10/88 . . Passivation; Containers; Encapsulations

19/00	Integrated devices, or assemblies of multiple devices, comprising at least one organic element specially adapted for rectifying, amplifying, oscillating or switching, covered by group H10K 10/00	30/50	• Photovoltaic [PV] devices
19/10	• comprising field-effect transistors	30/53	• • in the form of fibres or tubes, e.g. photovoltaic fibres
19/20	• comprising components having an active region that includes an inorganic semiconductor	30/57	• • comprising multiple junctions, e.g. tandem PV cells
19/201	• {Integrated devices having a three-dimensional layout, e.g. 3D ICs}	30/60	• in which radiation controls flow of current through the devices, e.g. photoresistors
19/202	• {Integrated devices comprising a common active layer}	30/65	• • Light-sensitive field-effect devices, e.g. phototransistors
19/80	• Interconnections, e.g. terminals	30/671	• {Organic radiation-sensitive molecular electronic devices}
19/901	• {Assemblies of multiple devices comprising at least one organic element specially adapted for rectifying, amplifying, oscillating or switching}	30/80	• Constructional details
		30/81	• • Electrodes
		30/82	• • • Transparent electrodes, e.g. indium tin oxide [ITO] electrodes
		30/821	• • • • {comprising carbon nanotubes}
		30/83	• • • • comprising arrangements for extracting the current from the cell, e.g. metal finger grid systems to reduce the serial resistance of transparent electrodes
		30/84	• • Layers having high charge carrier mobility
		30/85	• • • Layers having high electron mobility, e.g. electron-transporting layers or hole-blocking layers
		30/86	• • • Layers having high hole mobility, e.g. hole-transporting layers or electron-blocking layers
		30/865	• • {Intermediate layers comprising a mixture of materials of the adjoining active layers}
		30/87	• • Light-trapping means
		30/88	• • Passivation; Containers; Encapsulations
		30/89	• • Terminals, e.g. bond pads
		39/00	Integrated devices, or assemblies of multiple devices, comprising at least one organic radiation-sensitive element covered by group H10K 30/00
			NOTE
			This group only covers devices that are sensitive to infrared radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation.
30/00	Organic devices sensitive to infrared radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation (integrated devices or assemblies of multiple devices H10K 39/00, H10K 65/00; electrolytic light-sensitive devices H01G 9/20)		
	NOTE		
	This group covers organic semiconductor devices sensitive to radiation insofar as these devices are specially adapted for either:		
	• the conversion of the radiation energy into electrical energy; or		
	• the control of electrical energy by such radiation.		
30/10	• comprising heterojunctions between organic semiconductors and inorganic semiconductors	39/10	• Organic photovoltaic [PV] modules; Arrays of single organic PV cells
30/15	• • Sensitised wide-bandgap semiconductor devices, e.g. dye-sensitised TiO ₂ (photo-electrochemical devices comprising a liquid electrolyte or a solid electrolyte H01G 9/20)	39/12	• • Electrical configurations of PV cells, e.g. series connections or parallel connections
30/151	• • • {the wide bandgap semiconductor comprising titanium oxide, e.g. TiO ₂ }	39/15	• • comprising both organic PV cells and inorganic PV cells
30/152	• • • {the wide bandgap semiconductor comprising zinc oxide, e.g. ZnO}	39/18	• • Interconnections, e.g. terminals
30/20	• comprising organic-organic junctions, e.g. donor-acceptor junctions	39/30	• Devices controlled by radiation
30/211	• • {comprising multiple junctions, e.g. double heterojunctions}	39/32	• • Organic image sensors
30/30	• comprising bulk heterojunctions, e.g. interpenetrating networks of donor and acceptor material domains	39/34	• • • integrated with organic light-emitting diodes [OLED]
30/35	• • comprising inorganic nanostructures, e.g. CdSe nanoparticles	39/36	• • Devices specially adapted for detecting X-ray radiation
30/352	• • • {the inorganic nanostructures being nanotubes or nanowires, e.g. CdTe nanotubes in P3HT polymer}	39/38	• • Interconnections, e.g. terminals
30/353	• • {comprising blocking layers, e.g. exciton blocking layers}	39/401	• {Integrated devices having a three-dimensional layout, e.g. 3D ICs}
30/354	• {comprising a metal-insulator-semiconductor [m-i-s] structure}	39/501	• {Integrated devices comprising a common active layer}
30/40	• comprising a p-i-n structure, e.g. having a perovskite absorber between p-type and n-type charge transport layers		
30/451	• {comprising a metal-semiconductor-metal [m-s-m] structure}		

- 39/601 . {Assemblies of multiple devices comprising at least one organic radiation-sensitive element}

WARNING

Groups [H10K 39/601](#) and [H10K 39/621](#) are incomplete pending reclassification of documents from group [H10W 90/00](#). Groups [H10W 90/00](#), [H10K 39/601](#) and [H10K 39/621](#) should be considered in order to perform a complete search.

- 39/621 . . {comprising only organic radiation-sensitive elements}

Organic light-emitting devices

- 50/00** **Organic light-emitting devices** (integrated devices or assemblies of multiple devices [H10K 59/00](#), [H10K 65/00](#); organic semiconductor lasers [H01S 5/36](#))

- 50/10 . OLEDs or polymer light-emitting diodes [PLED]
50/11 . . characterised by the electroluminescent [EL] layers
50/115 . . . comprising active inorganic nanostructures, e.g. luminescent quantum dots
50/12 . . . comprising dopants
50/121 {for assisting energy transfer, e.g. sensitization}
50/125 . . . specially adapted for multicolour light emission, e.g. for emitting white light
50/13 comprising stacked EL layers within one EL unit
50/131 {with spacer layers between the electroluminescent layers}
50/135 . . . comprising mobile ions
50/14 . . Carrier transporting layers
50/15 . . . Hole transporting layers
50/155 comprising dopants
50/156 {comprising a multilayered structure}
50/157 {between the light-emitting layer and the cathode}
50/16 . . . Electron transporting layers
50/165 comprising dopants
50/166 {comprising a multilayered structure}
50/167 {between the light-emitting layer and the anode}
50/17 . . Carrier injection layers
50/171 . . . {Electron injection layers}
50/18 . . Carrier blocking layers
50/181 . . . {Electron blocking layers}
50/182 . . {OLED comprising a fiber structure}
50/19 . . Tandem OLEDs
50/30 . Organic light-emitting transistors
50/401 . {Organic light-emitting molecular electronic devices}
50/80 . Constructional details
50/805 . . Electrodes
50/81 . . . Anodes
50/813 characterised by their shape
50/814 combined with auxiliary electrodes, e.g. ITO layer combined with metal lines
50/816 Multilayers, e.g. transparent multilayers
50/818 Reflective anodes, e.g. ITO combined with thick metallic layers

- 50/82 . . . Cathodes
50/822 characterised by their shape
50/824 combined with auxiliary electrodes
50/826 Multilayers, e.g. opaque multilayers
50/828 Transparent cathodes, e.g. comprising thin metal layers
50/84 . . Passivation; Containers; Encapsulations
50/841 . . . {Self-supporting sealing arrangements}
50/842 . . . Containers
50/8423 {Metallic sealing arrangements}
50/8426 {Peripheral sealing arrangements, e.g. adhesives, sealants}
50/8428 {Vertical spacers, e.g. arranged between the sealing arrangement and the OLED}
50/844 . . . Encapsulations
50/8445 {multilayered coatings having a repetitive structure, e.g. having multiple organic-inorganic bilayers}
50/846 . . . {comprising getter material or desiccants}
50/85 . . Arrangements for extracting light from the devices
50/852 . . . comprising a resonant cavity structure, e.g. Bragg reflector pair
50/854 . . . comprising scattering means
50/856 . . . comprising reflective means
50/858 . . . comprising refractive means, e.g. lenses
50/86 . . Arrangements for improving contrast, e.g. preventing reflection of ambient light
50/865 . . . {comprising light absorbing layers, e.g. light-blocking layers}
50/868 . . {Arrangements for polarized light emission ([H10K 50/86](#) takes precedence)}
50/87 . . Arrangements for heating or cooling
50/88 . . Terminals, e.g. bond pads

- 59/00** **Integrated devices, or assemblies of multiple devices, comprising at least one organic light-emitting element covered by group [H10K 50/00](#)**

- 59/10 . OLED displays
59/12 . . Active-matrix OLED [AMOLED] displays
59/1201 . . . {Manufacture or treatment}
59/121 . . . characterised by the geometry or disposition of pixel elements
59/1213 {the pixel elements being TFTs}
59/1216 {the pixel elements being capacitors}
59/122 . . . Pixel-defining structures or layers, e.g. banks
59/123 . . . Connection of the pixel electrodes to the thin film transistors [TFT]
59/124 . . . Insulating layers formed between TFT elements and OLED elements
59/125 . . . including organic TFTs [OTFT]
59/126 . . . Shielding, e.g. light-blocking means over the TFTs
59/127 . . . comprising two substrates, e.g. display comprising OLED array and TFT driving circuitry on different substrates
59/1275 {Electrical connections of the two substrates}
59/128 . . . comprising two independent displays, e.g. for emitting information from two major sides of the display
59/129 . . . Chiplets
59/13 . . . comprising photosensors that control luminance

- 59/131 . . . Interconnections, e.g. wiring lines or terminals
 - 59/1315 {comprising structures specially adapted for lowering the resistance}
 - 59/17 . . Passive-matrix OLED displays
 - 59/173 . . . comprising banks or shadow masks
 - 59/176 . . . comprising two independent displays, e.g. for emitting information from two major sides of the display
 - 59/179 . . . Interconnections, e.g. wiring lines or terminals
 - 59/1795 {comprising structures specially adapted for lowering the resistance}
 - 59/18 . . Tiled displays
 - 59/19 . . Segment displays
 - 59/221 . . {Static displays, e.g. displaying permanent logos}
 - 59/30 . . Devices specially adapted for multicolour light emission
 - 59/32 . . Stacked devices having two or more layers, each emitting at different wavelengths
 - 59/35 . . comprising red-green-blue [RGB] subpixels
 - 59/351 . . . {comprising more than three subpixels, e.g. red-green-blue-white [RGBW]}
 - 59/352 . . . {the areas of the RGB subpixels being different}
 - 59/353 . . . {characterised by the geometrical arrangement of the RGB subpixels}
 - 59/38 . . comprising colour filters or colour changing media [CCM]
 - 59/40 . . OLEDs integrated with touch screens
 - 59/50 . . OLEDs integrated with light modulating elements, e.g. with electrochromic elements, photochromic elements or liquid crystal elements
 - 59/60 . . OLEDs integrated with inorganic light-sensitive elements, e.g. with inorganic solar cells or inorganic photodiodes
 - 59/65 . . OLEDs integrated with inorganic image sensors
 - 59/70 . . OLEDs integrated with inorganic light-emitting elements, e.g. with inorganic electroluminescent elements
 - 59/751 . . {Integrated devices having a three-dimensional layout, e.g. 3D ICs}
 - 59/771 . . {Integrated devices comprising a common active layer}
 - 59/80 . . Constructional details
 - 59/805 . . {Electrodes}
 - 59/8051 . . . {Anodes}
 - 59/80515 {characterised by their shape}
 - 59/80516 {combined with auxiliary electrodes, e.g. ITO layer combined with metal lines}
 - 59/80517 {Multilayers, e.g. transparent multilayers}
 - 59/80518 {Reflective anodes, e.g. ITO combined with thick metallic layers}
 - 59/8052 . . . {Cathodes}
 - 59/80521 {characterised by their shape}
 - 59/80522 {combined with auxiliary electrodes}
 - 59/80523 {Multilayers, e.g. opaque multilayers}
 - 59/80524 {Transparent cathodes, e.g. comprising thin metal layers}
 - 59/82 . . Interconnections, e.g. terminals ([H10K 59/131](#), [H10K 59/179](#) take precedence)
 - 59/84 . . Parallel electrical configurations of multiple OLEDs
 - 59/86 . . Series electrical configurations of multiple OLEDs
 - 59/87 . . {Passivation; Containers; Encapsulations}
 - 59/871 . . . {Self-supporting sealing arrangements}
 - 59/872 {Containers}
 - 59/8721 {Metallic sealing arrangements}
 - 59/8722 {Peripheral sealing arrangements, e.g. adhesives, sealants}
 - 59/8723 {Vertical spacers, e.g. arranged between the sealing arrangement and the OLED}
 - 59/873 . . . {Encapsulations}
 - 59/8731 {multilayered coatings having a repetitive structure, e.g. having multiple organic-inorganic bilayers}
 - 59/874 . . . {including getter material or desiccant}
 - 59/875 . . {Arrangements for extracting light from the devices}
 - 59/876 . . . {comprising a resonant cavity structure, e.g. Bragg reflector pair}
 - 59/877 . . . {comprising scattering means}
 - 59/878 . . . {comprising reflective means}
 - 59/879 . . . {comprising refractive means, e.g. lenses}
 - 59/8791 . . {Arrangements for improving contrast, e.g. preventing reflection of ambient light}
 - 59/8792 . . . {comprising light absorbing layers, e.g. black layers}
 - 59/8793 . . {Arrangements for polarized light emission ([H10K 59/8791](#) takes precedence)}
 - 59/8794 . . {Arrangements for heating and cooling}
 - 59/88 . . Dummy elements, i.e. elements having non-functional features
 - 59/90 . . Assemblies of multiple devices comprising at least one organic light-emitting element
- WARNING**
- Groups [H10K 59/90](#) and [H10K 59/95](#) are incomplete pending reclassification of documents from group [H10W 90/00](#). Groups [H10W 90/00](#), [H10K 59/90](#) and [H10K 59/95](#) should be considered in order to perform a complete search.
- 59/95 . . wherein all light-emitting elements are organic, e.g. assembled OLED displays
- 65/00 Integrated devices, or assemblies of multiple devices, comprising at least one organic light-emitting element and at least one organic radiation-sensitive element, e.g. organic opto-couplers (organic image sensors integrated with organic light-emitting devices [H10K 39/34](#); OLED displays integrated with photosensors [H10K 59/13](#))**
- WARNING**
- Group [H10K 65/00](#) is incomplete pending reclassification of documents from group [H10W 90/00](#). Groups [H10W 90/00](#) and [H10K 65/00](#) should be considered in order to perform a complete search.
- Manufacture or treatment; Constructional details**
- 71/00 Manufacture or treatment specially adapted for the organic devices covered by this subclass**
 - 71/10 . . Deposition of organic active material
 - 71/12 . . using liquid deposition, e.g. spin coating

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- 85/624 . . . {containing six or more rings}
- 85/625 . . . {containing at least one aromatic ring having 7 or more carbon atoms, e.g. azulene}
- 85/626 . . . {containing more than one polycyclic condensed aromatic rings, e.g. bis-anthracene}
- 85/631 . . {Amine compounds having at least two aryl rest on at least one amine-nitrogen atom, e.g. triphenylamine}
- 85/633 . . . {comprising polycyclic condensed aromatic hydrocarbons as substituents on the nitrogen atom}
- 85/636 . . . {comprising heteroaromatic hydrocarbons as substituents on the nitrogen atom}
- 85/649 . . {Aromatic compounds comprising a hetero atom}
- 85/652 . . . {Cyanine dyes}
- 85/653 . . . {comprising only oxygen as heteroatom}
- 85/654 . . . {comprising only nitrogen as heteroatom (H10K 85/652 takes precedence)}
- 85/655 . . . {comprising only sulfur as heteroatom}
- 85/656 . . . {comprising two or more different heteroatoms per ring (H10K 85/652 takes precedence)}
- 85/6565 {Oxadiazole compounds}
- 85/657 . . . {Polycyclic condensed heteroaromatic hydrocarbons}
- 85/6572 {comprising only nitrogen in the heteroaromatic polycondensed ring system, e.g. phenanthroline or carbazole}
- 85/6574 {comprising only oxygen in the heteroaromatic polycondensed ring system, e.g. cumarine dyes}
- 85/6576 {comprising only sulfur in the heteroaromatic polycondensed ring system, e.g. benzothiophene}
- 85/658 . . {Organoboranes}
- 85/701 . {Langmuir Blodgett films}
- 85/731 . {Liquid crystalline materials}
- 85/761 . {Biomolecules or bio-macromolecules, e.g. proteins, chlorophyll, lipids or enzymes}
- 85/791 . {Starburst compounds}

- 2101/80 . {Composition varying spatially, e.g. having a spatial gradient}
- 2101/90 . {Multiple hosts in the emissive layer}

Indexing scheme associated with groups H10K 10/80, H10K 30/80, H10K 50/80, H10K 59/80 and H10K 77/00, relating to constructional details

- 2102/00** **Constructional details relating to the organic devices covered by this subclass**
- 2102/10 . Transparent electrodes, e.g. using graphene
- 2102/101 . . {comprising transparent conductive oxides [TCO]}
- 2102/102 . . . {comprising tin oxides, e.g. fluorine-doped SnO₂}
- 2102/103 . . . {comprising indium oxides, e.g. ITO}
- 2102/20 . Metallic electrodes, e.g. using a stack of layers
- 2102/301 . {Details of OLEDs}
- 2102/302 . . {of OLED structures}
- 2102/3023 . . . {Direction of light emission}
- 2102/3026 {Top emission}
- 2102/3031 {Two-side emission, e.g. transparent OLEDs [TOLED]}
- 2102/3035 {Edge emission}
- 2102/311 . . {Flexible OLED}
- 2102/321 . . {Inverted OLED, i.e. having cathode between substrate and anode}
- 2102/331 . . {Nanoparticles used in non-emissive layers, e.g. in packaging layer}
- 2102/341 . . {Short-circuit prevention}
- 2102/351 . . {Thickness}
- 2102/361 . . {Temperature}

99/00 **Subject matter not provided for in other groups of this subclass**

Indexing scheme associated with group H10K 85/00, relating to properties of organic materials

- 2101/00** **Properties of the organic materials covered by group H10K 85/00**
- 2101/10 . Triplet emission
- 2101/20 . Delayed fluorescence emission
- 2101/25 . . using exciplex
- 2101/27 . {Combination of fluorescent and phosphorescent emission}
- 2101/30 . Highest occupied molecular orbital [HOMO], lowest unoccupied molecular orbital [LUMO] or Fermi energy values
- 2101/40 . Interrelation of parameters between multiple constituent active layers or sublayers, e.g. HOMO values in adjacent layers
- 2101/50 . Oxidation-reduction potentials, e.g. excited state redox potentials
- 2101/60 . Up-conversion, e.g. by triplet-triplet annihilation
- 2101/70 . Down-conversion, e.g. by singlet fission