

“GETTER SYSTEMS COMPRISING ONE OR MORE DEPOSITS OF GETTER MATERIAL AND A LAYER OF MATERIAL FOR THE TRANSPORT OF H₂O”

The present invention relates to getter systems comprising one or more deposits of
5 getter material, wherein at least one of said deposits is in contact with a layer of a material having H₂O transport properties.

The getter materials and systems are widely used in the industry in all applications wherein it is necessary to maintain vacuum or to control the composition of the gaseous atmosphere through the absorption of traces of undesired gases.

10 Getter materials widely used in the industrial productions are some metals such as titanium, zirconium, niobium, vanadium or hafnium or alloys thereof (and in particular, the zirconium- and titanium-based alloys), which are useful for the absorption of small molecules such as hydrogen, oxygen, water, carbon oxides and in some cases nitrogen. However, these materials have the limit of requiring relatively high temperatures
15 (generally higher than 300°C) for the activation of the getter function, which makes them unsuitable for the use in some devices, for instance those including organic materials.

Examples of applications wherein it is not possible to resort to thermal activation are the panels for thermal insulation filled with polymer foams, as described for instance
20 in patents US 4,444,821, US 5,505,810 and US 5,885,682; or OLED screens, described for instance in patent US 5,882,761.

Another particularly interesting application for the getter materials is in the microelectromechanical systems, better known in the field with the acronym MEMS, with particular reference to those MEMS comprising an interface with the external
25 environment made of a transparent element; by way of example, the DMDs (from Digital micro Mirror Device) are mentioned.

Among the getter materials which require thermal activation only at relatively low temperatures (compatible with the electroluminescent organic materials which form the active element of the screens using multilayers of electroluminescent organic materials,
30 known in the field as OLEDs) some porous materials such as active carbons can be mentioned, useful particularly for the absorption of organic substances, or zeolites,

silica or alumina, which are useful for the absorption of small-size gaseous molecules; materials not requiring thermal activation are the anhydrous chemical desiccants, specific for the absorption of moisture, such as for instance the oxides of the alkaline-earth metals, or some hygroscopic salts such as chlorides (e.g. calcium chloride, CaCl_2),
5 perchlorates (e.g. magnesium perchlorate, $\text{Mg}(\text{ClO}_4)_2$), or sulfates (e.g. calcium sulfate, CaSO_4).

Because of the importance of this application, in order to exemplify the uses of the getter systems of the invention reference will be made in particular to the use in OLEDs, but the getter systems of the invention are for general utilization and can be used also in
10 the applications wherein metals and metal alloys as mentioned above are normally used.

The organic multilayer elements arranged inside OLED screens are very sensitive to the presence of gas traces, in particular to humidity which can give rise to two different types of degradation phenomena:

- 15 - reduction of the screen life due to an attenuation of brightness with time, this phenomenon being associated with the amount of gaseous impurities responsible for the degradation which are present in the proximity of the organic materials multilayer. This type of phenomenon is caused by a concentration of such gaseous impurities being capable of triggering irreversible phenomena of degradation of the organic materials;
- 20 - tendency to a spatial non-homogeneity of brightness: this phenomenon is bound to the non-uniformity of the concentration of the impurities, with particular emphasis on the non-uniformity in the distribution of the concentration of H_2O permeating mainly through the adhesive that is used for sealing the OLED cavity. This phenomenon is particularly insidious as it can
25 appear in relatively short times, and the only way for avoiding the onset thereof is to guarantee a H_2O concentration which is as uniform as possible inside the cavity.

A technological solution capable of solving the problems related to the presence of gaseous impurities inside OLED screens has thus to guarantee, in correspondence to
30 the electroluminescent organic materials multilayer, low levels of H_2O and a concentration thereof being as uniform as possible.

A satisfactory technical solution for OLED screens has not been found yet. For instance in the patent US 6,833,668 B1 there is described the use of a resin, containing a getter material, being used for sealing the OLED cavity. However, this solution is not able to guarantee the uniformity of the H₂O concentration.

5 Another approach is described in the patent application WO2005/050736, that discloses means to adhere a getter composition to an inner surface of electronic devices, where the getter is in particle form dispersed in a suitable binder and a liquid medium.

10 A different solution is shown in patent application JP 2004-186043, where a distributed deposit of getter material is used along the whole peripheral edge of the active surface of the screen, thus creating a sort of frame of getter material acting as a barrier against the entry of impurities; also in this case it is not possible to guarantee a uniform H₂O concentration in correspondence to the organic multilayer. Such a concentration is in fact inevitably higher at the center of the device with respect to the edge.

15 Still another known solution is the one described in the patent application US 2004/0201347 A1, whose most general embodiment is schematically shown in figure 1. The OLED screen, 10, consists of a lower substrate 11, an electroluminescent active multilayer 12 being formed on a surface of the substrate 11, and a transparent front panel 13 being coupled by means of spacers 15, 15' to the lower substrate; lower
20 substrate 11, front panel 13 and spacers 15, 15' define an inner cavity 14. The front panel 13 has, on its internal surface, a coating made with a H₂O absorber 16 in order to remove the impurities which succeed in diffusing within the internal cavity 14. Said absorber 16 is transparent as it must be able to transmit to the outside the light radiation produced by the electroluminescent organic multilayer 12 through the front panel 13.

25 The electroluminescent organic multilayer 12, in order not to introduce useless complexity in the drawing, is exemplified with a simple rectangle, even if consisting of an assembly of elements among which a first series of electrodes, an organic multilayer and a second series of electrodes, which are sequentially stacked. This technical solution is potentially capable of solving the aforementioned problems associated with the
30 permeation of H₂O and O₂, having an absorber of impurities arranged in the proximity of the organic multilayer, and said layer of absorbing material has a larger extension

than the deposit of organic multilayer 12. The main problem with the previously shown technical solution is that, by reaction with the gas to be absorbed, the getter material generally undergoes structural and morphological modifications, for instance swellings,

which particularly in the case of the desiccants can be remarkable; further, as a consequence of the gas absorption, the getter material or the whole system containing the same can undergo other undesired modifications, such as the loss of transparency.

Object of the present invention is thus to provide a getter system being capable of overcoming the problem which are still present in the prior art, and in a first aspect thereof is a getter system comprising:

- one or more deposits of getter material, at least one of which comprises a getter being capable of absorbing H_2O ; and
- a layer of transparent material for the transport of H_2O , said layer of transparent material being arranged in contact with at least one of said getter deposits comprising a getter which is capable of absorbing H_2O .

In a second aspect thereof, the invention consists of a getter system for OLED screens comprising:

- one or more deposits of getter material at least one of which comprises a getter being capable of absorbing H_2O , which are arranged laterally with respect to the deposit of electroluminescent organic multilayer; and
- a layer of transparent material for the transport of H_2O being arranged in front of said electroluminescent organic multilayer, said layer of transparent material having an area which is not smaller than the area of said deposit of electroluminescent organic multilayer and being arranged in contact with at least one of said getter deposits comprising a getter capable of absorbing H_2O .

The arrangement of the layer of transparent material with H_2O transport function being present inside the OLED screen allows a broader selection of getter materials; in fact it is not necessary for them to be transparent, as the previously described arrangement places such materials out of the optical path of the radiation being emitted from the screen.

The invention will be described hereinafter with reference to the following drawings, wherein:

- figure 1 shows a sectional view of an OLED containing a getter system according to the prior art;

- figure 2 shows a sectional view of an OLED containing a getter system made according to the invention;
- figure 3 shows a sectional view of an OLED containing a getter system with maximum capacity, made according to the invention;
- 5 - figure 4 shows a sectional view of an OLED containing a getter system made according to the invention with a mechanism of surface transport of H_2O ;
- figure 5 shows a sectional view of an OLED containing a getter system made according to the invention which maximizes the exchange between the getter material and the transport layer;
- 10 - figure 6 shows a sectional view of an OLED containing a getter system made according to the invention with a mechanism of surface transport of H_2O , which minimizes the volume and the thickness of the same;
- figure 7 shows a sectional view of a MEMS containing a getter system made according to the invention; and
- 15 - figure 8 s shows a sectional view of an OLED containing a getter system made according to the invention with a mechanism of surface transport of H_2O .

The dimensions and the dimensional ratios of the various elements being shown in the drawings are not correct, and in particular the thickness of some elements has been
20 greatly enlarged in order to make the drawings easier to be interpreted.

Figure 1 shows a getter system for OLEDs according to the prior art and it has been already described previously.

The getter systems of the present invention differ from those of the prior art in that inside the cavity of the screen there is a material having the specific function of
25 capturing H_2O in the proximity of the element sensitive thereto (the electroluminescent organic multilayer) and transporting the H_2O to the getter material for allowing the absorption thereof.

This allows to solve the problems still being present with the solutions of the prior art, as with the present invention two components are used: the getter with the specific
30 duty of lowering the concentration of gaseous impurities by means of the absorption thereof, and a layer of material having an area equal or larger than that of said

electroluminescent organic multilayer, whose function is to take the water in gaseous phase being present in the proximity of the organic multilayer and transporting it to the getter material. Such a layer allows to obtain a uniform concentration of H₂O inside the screen.

5 The point, or to be more precise, the surface of contact between the getter material and the transport material is the region wherein the H₂O is transferred from the transport material to the getter material.

 Getter materials being suitable for carrying out the invention can be materials having the capability of removing all the harmful gaseous impurities such as H₂O, H₂,
10 O₂, hydrocarbons, N₂, CO, CO₂, or it is possible to use mixtures of materials each being capable of absorbing one or more harmful gaseous compounds. In any case at least one portion of a getter deposit must contain a material being capable of removing H₂O and be in contact with the transport layer of the same.

 This kind of solution has the advantage of modulating the composition of the
15 deposits of getter material on demand. The OLED screens and the MEMS can be produced with various materials being sensitive to different gaseous species, whereby depending on the type of device it is possible to choose the best getter composition for the deposits.

 Further, the fact that the getter material has to accomplish the sole function of
20 removing the impurities and not to deal also with the uniformity of the distribution of H₂O in the proximity of the organic multilayer, allows to place the material in a lateral position with respect to the organic multilayer and thus not to intercept the emitted light radiation. This allows a broader selection of usable materials as it is not necessary that the getter material has and maintains in time features of transparency, also upon
25 absorption of impurities.

 Thus the getter being arranged in peripheral position can be selected among those which specifically absorb water or oxygen or hydrocarbons or carbon monoxide or carbon dioxide or nitrogen or hydrogen and its isotopes or other harmful contaminants.

 Among the getters usable for the absorption of water we mention zeolites, silica
30 alumina, oxides of alkaline metals, oxides of alkaline-earth metals, oxides of nickel, zinc and cadmium, some hygroscopic salts such as chlorides (e.g. calcium chloride,

CaCl₂), perchlorates (e.g. magnesium perchlorate, Mg(ClO₄)₂), or sulfates (e.g. calcium sulfate, CaSO₄), various organic compounds, in the presence of Lewis or Brønsted acid or basic catalysts, such as the epoxides, organic molecules with double or triple bonds, compounds forming carbocations, anhydrides, alkoxides and acilic halides.

5 Among the getters usable for the absorption of oxygen we mention metals being easily oxidized, such as alkaline metals, alkaline-earth metals or other metals such as iron, tin and copper, low oxidation state metal oxides such as manganese and copper oxides, salts with phosphite or phosphonite anion and organic compounds being easily oxidized such as phenols, secondary aromatic amines, thioethers and aldehydes.

10 Among the getters usable for the absorption of hydrocarbons we mention zeolites and active carbons.

 Among the getters usable for the absorption of carbon monoxide we mention some metals, such as nickel and iron, some organic compounds, such as alkenes, amines and ketones in the presence of lithium-based organometallic compounds.

15 Among the getters usable for the absorption of carbon dioxide we mention the hydroxides of alkaline or alkaline-earth metals.

 Among the getters usable for the absorption of nitrogen we mention lithium, barium, BaLi₄ compound and porphyrins.

 Among the getters usable for the absorption of hydrogen and its isotopes we
20 mention palladium, palladium oxide, yttrium, titanium, zirconium, and alloys of titanium or zirconium with vanadium, iron, molybdenum, aluminum, chrome, tungsten, niobium, nickel and manganese.

 As far as it concerns the layers that have to accomplish the task of transporting H₂O, these are of two possible types, differing in the transport mechanism:

- 25 - layers performing H₂O surface transport;
 - layers absorbing H₂O and performing H₂O bulk transport.

 As far as it concerns layers for H₂O surface transport, they work on the principle of bonding H₂O molecules present in the gas phase and allowing their movement onto the layer surface towards the getter. The efficiency of these layers in bonding water on
30 the surface depends on the sticking probability of the material making up the layer and on the hydrophilic behavior of the surface. The sticking probability of the material, s,

represents the probability that, in case a water molecule being present in gaseous phase hits the surface of said material, it is bound to the same surface; $s > 0.1$ is considered a high sticking probability. The sticking probability generally depends on the chemical nature of the surface but also on the surface structure, in particular on the roughness of the same. A high sticking probability corresponds to a high roughness (0.05 μm Ra is considered a high roughness). The higher is the sticking probability and the stronger is the hydrophilicity of the material, the higher is the adsorption of H_2O .

The hydrophilic behavior and the sticking probability of the surface generally increase when the dispersive forces and the polar forces established between surface and water increase. The hydrophilic behavior of a surface is high also, and above all, when the surface is capable of forming hydrogen bonds with water. Thus, generally, all materials exposing at the surface polar groups comprising oxygen and/or nitrogen and/or sulfur and/or phosphorus, in particular -OH, -SH, -SO, -PO groups, have to be considered suitable. The hydrophilic behavior is generally translated into a given surface energy. The surface energy of water is equal to 72 mN/m. The closer is the surface energy of the material to the surface energy of water, the stronger is the hydrophilic behavior of this surface. Surfaces having surface energies higher than 45 mN/m are considered to be surfaces having strong hydrophilic behavior.

Among the materials usable as surface transport elements there are all hydrophilic polymer materials (laid in the shape of thin film, with thickness lower than about 10 nm, for instance by means of spin coating; in this case the transport of water molecules is essentially of the surface type because such thin films have no bulk), namely polyacrylates and polymethacrylates, polyetherimides (PEI), polyamides (PA), cellulose acetate (CA), cellulose triacetate (TCA), polysiloxanes (also known as silicones), polyvinyl alcohol (PVAL), polyethylene oxide (PEO), polyethylene glycol (PEG), polypropylene glycol (PPG), polyvinyl acetate (PVAC), polyoxymethylene (POM), poly(ethylene vinyl alcohol) copolymers (EVAL, EVOH), poly(amide-ethylene oxide) copolymers (PA-PEO), poly(urethane-ethylene oxide) copolymers (PUR-PEO), poly(ethylene-vinyl acetate) copolymers (EVA, EVAC).

Other hydrophilic materials usable for producing a surface transport element are the nanosized oxides (average particle size $d = 1\div 200$ nm), prepared by sol-gel

techniques or by spray flame pyrolysis and deposited in the form of thin film (thickness ≤ 1000 nm), for instance by means of screen-printing techniques. Oxides usable for the purpose are In_2O_3 , ZnO , SnO_2 , TiO_2 , WO_3 and mixtures thereof.

5 The deposits of nanosized particles can also be treated by UV radiation or by ion bombardment for the creation of surface roughness, dangling bonds and lattice holes. UV radiation and ion bombardment can be carried out in the presence of oxygen or water vapor or the previously treated surfaces can be successively exposed to oxygen or water.

10 Surface H_2O transport layers as those described above can be deposited onto the surfaces of the OLED cavity other than the polymeric multilayer that is the element active in the light emission phenomenon; for convenience, these layers are preferably deposited, along with the getter material to which they convey H_2O , onto the transparent window of the device, with the transport layer that can directly face said multilayer, while the getter material is positioned laterally with respect thereto.

15 In addition to the above cited materials, having inherently hydrophilic behavior, it is also possible to use many others polymeric materials not normally considered hydrophilic or known as hydrophobic, provided they are subjected to a suitable treatment that changes the properties of their surface making this latter hydrophilic. Hydrophobic materials are those materials whose surface energy is < 30 mN/m, such as
20 PTFE (surface energy = 18 mN/m). The treatments to change into hydrophilic the properties of the surfaces of hydrophobic materials are, e.g., oxidative treatments in flame, in corona discharge or in plasma in the presence of oxygen or water vapor; an etching treatment performed by means of ion bombardment (e.g. argon, 0.5÷5 keV energies, 1×10^{12} ÷ 1×10^{18} ions/cm² doses) is also effective. All these treatments
25 determine the erosion of the surface of the polymeric material (with an increase in the roughness and in the sticking probability), the creation of dangling bonds (surface non-saturations) and the formation of -O and -OH groups because of the presence of oxygen or water during the treatment.

30 Polymeric materials that can be used in this case are, e.g., polyethylene (PE), polypropylene (PP), polycarbonate (PC), polymethylmethacrylate (PMMA), polystyrene (PS), polyethylene terephthalate (PET), polytetrafluoroethylene (PTFE) and

polyimides (PI).

In this case the overall thickness of the polymeric layer may be relatively high, e.g., higher than 1000 nm, while the thickness of the hydrophilic surface is generally of only a few monolayers, thus in the range of nanometers.

5 Surface H₂O transport materials of this latter kind can be positioned over the transparent window of the device, but also adhered directly to the organic multilayer active in light emission, provided the surface of the transport layer made hydrophilic is not the one contacting the organic multilayer.

10 In an alternative embodiment, the layer transporting water towards the getter is made in such a way that said transport takes place in the bulk of the material making up the layer.

For a given quantity of material forming the layer (determined by the thickness, length and width of the parallelepiped being deposited on the OLED or MEMS front substrate), the higher is the solubility of the material, S, the higher is the H₂O
15 absorption.

For a given geometry of the layer, the speed at which it is capable of transporting water is proportional to the diffusion coefficient, D, of the material it is made of.

Since the permeability P of a material is defined as $P = S \times D$, it is possible to define the preferred materials for the production of a mass transport element as those
20 materials having a permeability higher than $1 \times 10^{-12} \text{ (m}_{\text{STP}})^3 \cdot \text{m}^2 / \text{bar} \cdot \text{m}^3 \cdot \text{s}$ (m_{STP}^3 stands for cubic meters of gas measured at standard temperature and pressure). The materials being strongly permeable to water are also said strongly hydrophilic.

The preferred material for the production of this layer is of a polymer type. Among the possible polymer materials usable and among the manufacturing processes
25 thereof the ones that allow to obtain the maximum free volume of the polymer medium, the maximum order and regularity of the polymer chains, the minimum degree of cross-linking, the minimum packing density and the maximum interactions with the permeating species must be preferred.

The preferred materials for producing the bulk water transport layer are the same
30 hydrophilic polymeric materials listed before for the production of the surface transport layer; in this case however the characteristic thickness of the layer is higher than in the

case of surface transport layers, typically in the range of hundreds or thousands of nanometers.

Figure 2 shows a first embodiment of a getter system for OLED 20, according to the present invention. The difference with respect to the elements of the prior art, already described when discussing figure 1 (same numerals in fig. 1, fig. 2 and the subsequent figures indicate same elements), consists in the deposits of getter material 26, 26' being arranged on the internal surface of the front substrate 13 in a lateral position with respect to the organic multilayer 12, which is arranged on the surface of the lower substrate 11. Further the getter deposits are connected to a layer of transparent material, 27, with properties of absorption and transmission of the impurities.

The surface of exchange of the impurities between the transparent layer and the getter material is represented by the contact surface between layer 27 and the getter deposits 26, 26'. This type of geometry is suitable for transparent layers transporting H₂O inside them (bulk transport).

A particularly interesting variation is shown in figure 3; in this case the getter system for OLED 30 comprises getter deposits 36, 36' extending partially inside the upper substrate 13 and connected to the transport layer 37. This type of solution is particularly useful when it is desired to increase the gettering capacity of the system, that is obviously related to the quantity of material with gettering action included in the cavity 14. This geometry too is particularly suitable when bulk transport layers are used.

With respect to what is shown in figure 2 and 3 and previously described, there are some possible variations which do not modify in any way the purpose or the functionality of the system; in particular, there could be only one of the two getter deposits, or the getter deposits could be made of the same material or of different materials, in this last case a deposit could be formed by a material being capable of absorbing only H₂O, with the other capable of sorbing all other impurities.

As shown in the getter system for OLED 40 illustrated in figure 4 the height of the transport layer and of the getter material might also be different, in particular in this case the thickness of the transport layer 47 is remarkably low with respect to the thickness of the deposits of getter materials 46, 46'. This type of solution is preferred in layer 47 works according to the surface transport mechanism.

Figure 5 shows in cross-section a getter system for OLED 50 maximizing the contact surface and thus the exchange between the H₂O transport layer 57 and the deposits of getter material 56, 56'. This type of embodiment is the preferred one in the case of bulk transport of H₂O inside the material.

5 Figure 6 shows another OLED, 60, in which the configuration of the getter system is interesting for the case wherein the water is conveyed by the layer 67 to the deposits of getter material 66, 66' according to the surface transport mechanism; the illustrated configuration is such to minimize the volume and the thickness of the getter system.

10 The various configurations being shown for the OLED screens are also usable in the case of MEMS 70 as shown in figure 7. Also in this case there is a cavity 74 being defined by two substrates 71, 73 reciprocally sealed by the elements 75, 75', including an active element 72 which is sensitive to the presence of gaseous impurities and particularly sensitive to the presence of H₂O; for instance, it can be a series of reflective micro mirrors as in the case of the DMDs.

15 Unlike the case of the OLEDs only a portion 78 of the upper substrate 73 is transparent. Similarly to what is shown in figure 2 the deposits of getter material 76, 76' are on the upper substrate, laterally with respect to the active element and to the transparent window, and said deposits are connected by a layer of material 77 for the transport of H₂O.

20 All considerations and configurations for OLEDs shown in figures 3-6 can be applied to the case of MEMS.

25 Finally, figure 8 shows another possible positioning of a getter system according to the invention, suitable for use in an OLED 80. In this case the getter system is formed by getter deposits 86, 86', in contact with the transport layer 87; this latter is made of a hydrophobic material whose surface facing the cavity 14 has been treated so as to render it hydrophilic. The transport of water in this case takes place along the surface of layer 87 and towards the deposits 86, 86', while the bulk of layer 87 acts as a barrier against the penetration into the organic multilayer 12 of water molecules present in cavity 14.

CLAIMS

1. A getter system comprising: one or more deposits of getter material, at least one of which comprises a getter capable of absorbing H_2O , characterized in that said
5 getter system further comprises a layer of transparent material for the transport of H_2O , said layer of transparent material being arranged in contact with at least one of said getter deposits comprising a getter being capable of absorbing H_2O .

2. A getter system according to claim 1 wherein said getter being capable of absorbing H_2O is selected among zeolites, silica, alumina, oxides of alkaline metals,
10 oxides of alkaline-earth metals, oxides of nickel, zinc and cadmium, chlorides, perchlorates, sulfates, epoxides, organic molecules with double and triple bonds in the presence of Lewis or Brønsted acid or basic catalysts, compounds forming carbocations, anhydrides, alkoxides and acilic halides.

3. A getter system according to claim 1 wherein at least one of said getter
15 deposits comprises a getter for oxygen.

4. A getter system according to claim 3 wherein said getter for oxygen is selected among alkaline metals, alkaline-earth metals or other metals such as iron, tin and copper, manganese and copper oxides, salts with phosphite or phosphonite anion, phenols, secondary aromatic amines, thioethers and aldehydes.

20 5. A getter system according to claim 1 wherein at least one of said getter deposits comprises a getter for hydrocarbons.

6. A getter system according to claim 5 wherein said getter for hydrocarbons is selected between zeolites or active carbons.

7. A getter system according to claim 1 wherein at least one of said getter
25 deposits comprises a getter for CO .

8. A getter system according to claim 7 wherein said getter for CO is selected among nickel, iron, alkenes, amines and ketones in the presence of lithium-based organometallic compounds.

9. A getter system according to claim 1 wherein at least one of said getter
30 deposits comprises a getter for CO_2 .

10. A getter system according to claim 9 wherein said getter for CO₂ is selected between hydroxides of alkaline or alkaline-earth metals.

11. A getter system according to claims 1 wherein at least one of said getter deposits comprises a getter for H₂.

5 12. A getter system according to claim 11 wherein said getter for H₂ is selected among palladium, palladium oxide, yttrium, titanium, zirconium and alloys of titanium or zirconium with vanadium, iron, molybdenum, aluminum, chrome, tungsten, niobium, nickel and manganese.

10 13. A getter system according to claim 1 wherein at least one of said getter deposits comprises a getter for N₂.

14. A getter system according to claim 13 wherein said getter for N₂ is selected among lithium, barium, BaLi₄ compound and porphyrins.

15 15. A getter system according to claim 1 wherein said layer of transparent material for the transport of H₂O transports H₂O according to a surface transport mechanism.

16. A getter system according to claim 15 wherein said layer has a thickness lower than about 10 nm and is made of a material is selected among polyacrylates and polymethacrylates, polyetherimides (PEI), polyamides (PA), cellulose acetate (CA), cellulose triacetate (TCA), polysiloxanes, polyvinyl alcohol (PVAL), polyethylene oxide (PEO), polyethylene glycol (PEG), polypropylene glycol (PPG), polyvinyl acetate (PVAC), polyoxymethylene (POM), poly(ethylene vinyl alcohol) copolymers (EVAL, EVOH), poly(amide-ethylene oxide) copolymers (PA-PEO), poly(urethane-ethylene oxide) copolymers (PUR-PEO), poly(ethylene-vinyl acetate) copolymers (EVA, EVAC).

25 17. A getter system according to claim 15 wherein said transparent material is selected among hydrophobic polymers which have undergone surface treatments selected among an oxidative treatment in flame, an oxidative treatment in corona discharge, an oxidative treatment in plasma in the presence of oxygen or water vapor and an etching treatment by means of ion bombardment.

30 18. A getter system according to claim 17, wherein said hydrophobic polymers are chosen among polyethylene (PE), polypropylene (PP), polycarbonate (PC),

polymethylmethacrylate (PMMA), polystyrene (PS), polyethylene terephthalate (PET), polytetrafluorethylene (PTFE) and polyimides (PI).

19. A getter system according to claim 15 wherein said transparent material is selected among nanosized oxides.

5 20. A getter system according to claim 19 wherein said nanosized oxides are selected among In_2O_3 , ZnO , SnO_2 , TiO_2 , WO_3 and mixtures thereof.

21. A getter system according to claim 19 wherein said nanosized oxides have been treated by UV radiation or ion bombardment.

10 22. A getter system according to claim 1 wherein said layer of transparent material for the transport of H_2O transports H_2O according to a bulk transport mechanism.

15 23. A getter system according to claim 22 wherein said transparent material is selected among polyacrylates and polymethacrylates, polyetherimides (PEI), polyamides (PA), cellulose acetate (CA), cellulose triacetate (TCA), polysiloxanes, polyvinyl alcohol (PVAL), polyethylene oxide (PEO), polyethylene glycol (PEG), polypropylene glycol (PPG), polyvinyl acetate (PVAC), polyoxymethylene (POM), poly(ethylene vinyl alcohol) copolymers (EVAL, EVOH), poly(amide-ethylene oxide) copolymers (PA-PEO), poly(urethane-ethylene oxide) copolymers (PUR-PEO), poly(ethylene-vinyl acetate) copolymers (EVA, EVAC).

20 24. An OLED screen (20; 30; 40; 50; 60; 80) comprising a getter system of claim 1, wherein one or more deposits of getter material (26, 26'; 36, 36'; 46, 46'; 56, 56'; 66, 66'; 86, 86'), at least one of which comprises a getter capable of absorbing H_2O , are laterally arranged with respect to an electroluminescent organic multilayer (12); and a layer of transparent material for the transport of H_2O (27; 37; 47; 57; 67; 87) is arranged in front of said electroluminescent organic multilayer, said layer of transparent material having an area which is not smaller than the area of said electroluminescent organic multilayer and being arranged in contact with at least one of said getter deposits comprising a getter being capable of absorbing H_2O .

25 25. A MEMS (70) comprising a getter system of claim 1, wherein one or more deposits of getter material (76, 76'), at least one of which comprises a getter capable of absorbing H_2O , are laterally arranged with respect to an active element (72); and a layer

of transparent material for the transport of H_2O (77) is arranged in front of said active element, said layer of transparent material having an area which is not smaller than the area of said active element and being arranged in contact with at least one of said getter deposits comprising a getter being capable of absorbing H_2O .