Amended PATENT CLAIMS

1. Use of printable, sterically stabilised inks for the formation of dense, homogeneous Al_2O_3 coatings or mixed Al_2O_3 hybrid layers as diffusion barrier and for electronic or electrical passivation, where
   a) inks are used in which the layer-forming components are adjusted in relation to one another so that the solids content is between 0.5 and 10% by weight, preferably between 1 and 6% by weight,
   b) the inks used are sterically stabilised by mixing with at least one hydrophobic component, at least one hydrophilic compound selected from the group acetylacetone, dihydroxybenzoic acid and trihydroxybenzoic acid or structurally related compounds thereof and optionally with at least one chelating agent,
   and
   c) for hydrolysis of the alkoxides present, the inks are mixed with water in a molar ratio of water to precursor between 1 : 1 and 1 : 9, preferably between 1 : 1.5 and 1 : 1.25.

2. Use of inks according to Claim 1 which comprise precursors for the formation of Al_2O_3 and for the formation of one or more of the oxide(s) of the elements, selected from the group boron, gallium, silicon, germanium, zinc, tin, phosphorus, titanium, zirconium, yttrium, nickel, cobalt, iron, cerium, niobium, arsenic and lead oxides, where the inks are obtained by introduction of corresponding precursors into the ink.

3. Use of inks according to Claim 1 or 2 which comprise at least one hydrophobic component selected from the group 1,3-cyclohexadione, salicylic acid and structurally related compounds, and at least one hydrophilic compoundselected from the group acetylacetone, dihydroxybenzoic acid and trihydroxybenzoic acid or structurally related compounds thereof, chelating agents, such as ethylenediaminetetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DETPA), nitrilotriacetic acid (NTA), ethylenediaminetetramethylenephosphonic acid (EDTPA) and diethylenetriaminepentamethylenephosphonic acid (DETPPA) or structurally related complexing agents or corresponding chelating agents.

4. Use of inks according to Claim 1, 2 or 3 which comprise solvents selected from the group of the low-boiling alcohols, preferably selected from the group ethanol and isopropanol, and at least one high-boiling alcohol selected from the group of the high-boiling glycol ethers, preferably selected from the group diethylene glycol monoethyl ether, ethylene glycol monobutyl ether and diethylene glycol monobutyl ether or mixtures thereof, and optionally polar solvents from selected from the group acetone, DMSO, sulfolane and ethyl acetate or similar polar solvents.

5. Use of inks according to Claims 1, 2, 3 or 4 which have an acidic pH in the range 4 – 5 and, as acids, comprise one or more organic acids which result in residue-free drying.

6. Use of inks according to one or more of Claims 1 to 5 for the production of a diffusion barrier, a printed dielectric, an electronic and electrical passivation, an antireflection coating, a mechanical protection layer against wear, a chemical protection layer against oxidation or the action of acid.

7. Use of inks according to one or more of Claims 1 to 5 for the preparation of hybrid materials comprising simple and polymeric boron and phosphorus oxides and alkoxides thereof for the full-area and local doping of semiconductors, preferably of silicon.

8. Use of inks according to one or more of Claims 1 to 5 for the production of hybrid layers which have a boron trioxide content in the range 5 – 55 mol%, preferably in the range 20 – 45 mol%.

9. Use of inks according to one or more of Claims 1 to 5 for the production of Al_2O_3 layers as sodium and potassium diffusion barriers in LCD technology.

10. Process for the production of pure residue-free amorphous Al_2O_3 layers on mono- or multicrystalline silicon wafers, sapphire wafers, thin-film solar modules, glasses coated with functional materials (for example ITO, FTO, AZO, IZO or the like) or uncoated glasses, steel elements and alloys, and on other materials used in microelectronics,

characterised in that, after application of a thin layer of ink according to one or more of Claims 1 to 5, the drying is carried out at temperatures between 300 and 1000°C, preferably at 300 to 450°C.

11. Process according to Claim 10, characterised in that, before application of the ink, the surface, which is optionally in hydrophobically or hydrophilically terminated form, is cleaned, preferably by etching with HF solution or water.

12. Process according to Claims 10 or 11, characterised in that drying and heat-treatment at temperatures from 1000°C gives hard, crystalline layers having comparable properties to corundum.

13. Process according to Claims 10 or 11, characterised in that the drying is carried out within a few minutes, preferably within a time of less than 5 minutes, where a layer having a thickness in the range from 20 to 300 nm, preferably of less than 100 nm, which has surface-passivating properties is formed from the printed-on sol-gel composition.

14. Process according to one or more of Claims 10 to 13for the production of pure, residue-free, amorphous structurable Al_2O_3 layers, characterised in that, after the application of a thin layer of ink in accordance with one or more of Claims 1 to 7, the drying is carried out at temperatures between 300°C and 500°C optionally followed by a heat-treatment step, which is carried out at temperatures at 350 to 550°C under nitrogen and/or forming-gas atmosphere.

15. Printable, sterically stabilised inks for the formation of dense, homogeneous Al_2O_3 coatings or mixed Al_2O_3 hybrid layers as diffusion barrier and for electronic or electrical passivation, characterised in that they

a) comprise layer-forming components are adjusted in relation to one another so that the solids content in the ink is between 0.5 and 10% by weight, preferably between 1 and 6% by weight,

b) are sterically stabilised by mixing with at least one hydrophobic component, at least one hydrophilic compound selected from the group acetylacetone, dihydroxybenzoic acid and trihydroxybenzoic

acid or structurally related compounds thereof, and optionally with at least one chelating agent,

and

c) for hydrolysis, the alkoxides present are mixed with water in a molar ratio of water to precursor between 1 : 1 and 1 : 9, preferably between 1 : 1.5 and 1 : 1.25.

PATENT CLAIMS

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   and
   c) for hydrolysis of the alkoxides present, the inks are mixed with water in a molar ratio of water to precursor between 1 : 1 and 1 : 9, preferably between 1 : 1.5 and 1 : 1.25.

2. Use of inks according to Claim 1 which comprise precursors for the formation of Al_2O_3 and for the formation of one or more of the oxide(s) of the elements, selected from the group boron, gallium, silicon, germanium, zinc, tin, phosphorus, titanium, zirconium, yttrium, nickel, cobalt, iron, cerium, niobium, arsenic and lead oxides, where the inks are obtained by introduction of corresponding precursors into the ink.

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6. Use of inks according to one or more of Claims 1 to 5 for the production of a diffusion barrier, a printed dielectric, an electronic and electrical passivation, an antireflection coating, a mechanical protection layer against wear, a chemical protection layer against oxidation or the action of acid.

7. Use of inks according to one or more of Claims 1 to 5 for the preparation of hybrid materials comprising simple and polymeric boron and phosphorus oxides and alkoxides thereof for the full-area and local doping of semiconductors, preferably of silicon.

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14. Process according to one or more of Claims 10 to 13for the production of pure, residue-free, amorphous structurable Al_2O_3 layers, characterised in that, after the application of a thin layer of ink in accordance with one or more of Claims 1 to 7, the drying is carried out at temperatures between 300°C and 500°C optionally followed by a heat-treatment step, which is carried out at temperatures at 350 to 550°C under nitrogen and/or forming-gas atmosphere.

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