CLAIMS

1. A screen-printing ink, comprising:
graphite;
an electrically conductive binder to bind the graphite;
a cross-linking agent to cross-link the binder; and
between 1 wt% and 50 wt% of a hydrophobicity modifier.

2. The screen-printing ink of claim 1, comprising between about 5 percentage by mass (wt%) and about 50 wt% of the graphite.

3. The screen-printing ink of claim 2, comprising between about 10 wt% and about 50 wt% of the graphite.

4. The screen-printing ink of any one of the preceding claims, comprising between 50 wt% and 90 wt% of the electrically conductive binder.

5. The screen-printing ink of any one of the preceding claims, wherein the electrically conductive binder is selected from a group consisting of poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS), polyacetylene, polyaniline, polypyrrole, polythiophene, poly(para-phenylene), poly(phenylenevinylene) and polyfuran.

6. The screen-printing ink of any one of the preceding claims, comprising between 1 wt% and 20 wt% of the cross-linking agent.

7. The screen-printing ink of claim 6, comprising between 2 wt% and 20 wt% of the cross-linking agent.

8. The screen-printing ink of any one of the preceding claims, wherein the cross-linking agent comprises a methoxysilane compound or divinylsulfone.

9. The screen-printing ink of claim 8, wherein the methoxysilane compound is selected from a group consisting of (3-glycidoxypropyl)trimethoxysilane (GPTMS), 3-chloropropyltrimethoxysilane, and 3-methacryloxypropyltrimethoxysilane.

10. The screen-printing ink of any one of the preceding claims, further comprising a conductivity modifier.

11. The screen-printing ink of claim 10, comprising between 1 wt% and 10 wt% of the conductivity modifier.

12. The screen-printing ink of claim 10 or 11, wherein the conductivity modifier is selected from a group consisting of dimethyl sulfoxide (DMSO), ethylene glycol, sorbitol, glycerol, polytetrafluoroethylene, phosphoric acid, sulfuric acid and sulfonic acid.

13. The screen-printing ink of any one of the preceding claims, wherein the hydrophobicity modifier is selected from a group consisting of a polyanion, polyurethane, polymethyl methacrylate and polytetrafluoroethylene.

14. The screen-printing ink of claim 13, wherein the polyanion is selected from a group consisting of a fluoropolymer-copolymer, poly(acrylic acid sodium salt) and poly(ethylene oxide)-block-poly(sodium 4-vinylbenzenesulfonate).

15. A method of manufacturing a screen-printing ink, comprising:

mixing graphite in an electrically conductive binder modified with a cross-linking agent and a hydrophobicity modifier to form a mixture; and

centrifuging the mixture to produce the screen-printing ink,

wherein the screen-printing ink comprises between 1 wt% and 50 wt% of the hydrophobicity modifier.

16. The method of manufacturing the screen-printing ink according to claim 15, wherein the electrically conductive binder is selected from a group consisting of poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS), polyacetylene,

polyaniline, polypyrrole, polythiophene, poly(para-phenylene), poly(phenylenevinylene) and polyfuran.

17. The method of manufacturing the screen-printing ink according to claim 15 or 16, wherein the cross-linking agent comprises a methoxysilane compound or divinylsulfone.

18. The method of manufacturing the screen-printing ink according to claim 17, wherein the methoxysilane compound is selected from a group consisting of (3-glycidoxypropyl)trimethoxysilane (GPTMS), 3-chloropropyltrimethoxysilane, 3-methacryloxypropyltrimethoxysilane and 3-methacryloxypropyltrimethoxysilane.

19. The method of manufacturing the screen-printing ink according to any one of claims 15 to 18, wherein the mixing comprises mixing with a conductivity modifier to form the mixture.

20. The method of manufacturing the screen-printing ink according to any one of claim 19, wherein the conductivity modifier is selected from a group consisting of dimethyl sulfoxide (DMSO), ethylene glycol, sorbitol, glycerol, polytetrafluoroethylene, phosphoric acid, sulfuric acid and sulfonic acid.

21. The method of manufacturing the screen-printing ink according to any one of claims 15 to 20, wherein the hydrophobicity modifier is selected from a group consisting of a polyanion, polyurethane, polymethyl methacrylate and polytetrafluoroethylene.

22. The method of manufacturing the screen-printing ink according to claim 21, wherein the polyanion is selected from a group consisting of a fluoropolymer-copolymer, poly(acrylic acid sodium salt) and poly(ethylene oxide)-block-poly(sodium 4-vinylbenzenesulfonate).

23. A method of producing a screen-printed electrode, comprising:

providing a substrate;

screen printing a layer of electrically conductive ink onto the substrate to form an electrically conductive layer;

screen printing a layer of the screen-printing ink of any one of claims 1 to 14 onto the electrically conductive layer; and

annealing the printed screen-printing ink to form the screen-printed electrode.

24. The method of producing the screen-printed electrode according to claim 23, further comprising:

screen printing an encapsulating layer over the screen-printed electrode; and

annealing the encapsulating layer.

25. The method of producing the screen-printed electrode according to claim 24, wherein the encapsulating layer comprises barium titanate.

26. A screen-printed electrode, comprising:

a substrate;

an electrically conductive layer formed on the substrate; and

the screen-printing ink of any one of claims 1 to 14 screen-printed onto the electrically conductive layer.