CLAIMS

What is claimed is:

1. A process for producing a photovoltaic system comprising:
depositing a first electrode layer over a substrate;
spray coating an ethoxylated polyethyleneimine (PEIE) layer over the first electrode layer;
depositing a bulk heterojunction active layer over the PEIE layer;
spray coating a poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) hole transport layer over the bulk heterojunction active layer; and
depositing a second electrode layer over the PEDOT:PSS hole transport layer.

2. The process of claim 1, wherein:
the first electrode layer is spray coated over the substrate; and/or
the bulk heterojunction active layer is spray coated over the PEIE layer; and/or
the second electrode layer is spray coated over the PEDOT:PSS hole transport layer.

3. The process of either of claims 1 or 2, further comprising:
spray coating a dielectric layer over the substrate; and
spray coating the first electrode layer over the dielectric layer.

4. The process of claim 3, wherein the dielectric layer comprises a cured acrylic urethane clear-coat layer having a surface roughness (Ra) of less than 25 nanometers.

5. The process of either of claims 3 or 4, wherein the dielectric layer has a surface roughness (Ra) of less than 15 nanometers.

6. The process of any one of claims 1 to 5, wherein the PEDOT:PSS hole transport layer comprises a PEDOT:PSS CPP layer and is spray coated using a formulation comprising poly(3,4-ethylenedioxythiophene), poly(styrene sulfonate), N-Methyl-2-pyrrolidone, a gamma-glycidoxypropyltrimethoxysilane crosslinking agent, isopropanol, and an acetylenic glycol-based nonionic surfactant.

7. The process of any one of claims 1 to 6, further comprising:
depositing a low work function metallic layer over the first electrode layer, and
spray coating the PEIE layer over the low work function metallic layer.

8. The process of any one of claims 1 to 7, wherein the bulk heterojunction active layer comprises poly[[4,8-bis[(2-ethylhexyl)oxy]benzo[1,2-b:4,5-b']dithiophene-2,6-diyl][3-fluoro-2-[(2-ethylhexyl)carbonyl]thieno[3,4-b]thiophenediyl]]::[6,6]-phenyl C_{61}-butyric acid methyl ester (PTB7:PCBM).

9. The process of any one of claims 1 to 7, wherein the bulk heterojunction active layer comprises poly(3-hexyl thiophene):[6,6]-phenyl C_{61}-butyric acid methyl ester (P3HT:PCBM).

10. The process of any one of claims 1 to 9, wherein the first electrode layer and the second electrode layer comprise spray coated silver layers.

11. The process of claim 10, wherein the silver layers are formed from the reaction products of a Tollens' reaction.

12. The process of any one of claims 1 to 9, wherein the first electrode layer and the second electrode layer comprise spray coated layers comprising PEDOT:PSS PH1000.

13. The process of any one of claims 1 to 9, wherein one of the first electrode layer and the second electrode layer comprises a spray coated silver layer, the other electrode layer comprising a spray coated layer comprising PEDOT:PSS PH1000.

14. The process of claim 13, wherein the first electrode layer comprises a silver layer, and the second electrode layer comprises a blend of PEDOT:PSS PH1000 and PEDOT:PSS CPP.

15. The process of claim 14, wherein the silver layer is formed from the reaction products of a Tollens' reaction.

16. The process of any one of claims 1 to 9, wherein at least one of the first electrode layer and the second electrode layer comprises a layer of dielectric material comprising silver or copper particles embedded in the dielectric material.

17. The process of claim 16, wherein the layer of dielectric material comprises a cured acrylic urethane clear-coat layer.

18. The process of any one of claims 1 to 17, further comprising:

spray coating an inorganic hole transport layer over the bulk heterojunction active layer, and

spray coating the PEDOT:PSS CPP hole transport layer over the inorganic hole transport layer.

19. The process of claim 18, wherein the inorganic hole transport layer comprises molybdenum trioxide.

20. The process of any one of claims 1 to 19, wherein the PEIE layer is spray coated using an aqueous formulation substantially free of methoxyethanol.

21. The process of any one of claims 1 to 20, wherein the PEIE layer is spray coated using an aqueous formulation consisting of PEIE and water.

22. The process of any one of claims 1 to 21, wherein the second electrode layer comprises a spray coated layer comprising PEDOT:PSS PH1000.

23. The process of any one of claims 1 to 22, wherein the second electrode layer comprises a spray coated layer comprising PEDOT:PSS CPP.

24. The process of any one of claims 1 to 23, wherein the second electrode layer comprises a spray coated layer comprising a blend of PEDOT:PSS PH1000 and PEDOT:PSS CPP.

25. A process for producing a low work function electrode for a photovoltaic system comprising:

depositing an electrode layer over a substrate; and

spray coating an ethoxylated polyethyleneimine (PEIE) layer over the electrode layer, wherein the PEIE layer is spray coated using an aqueous formulation substantially free of methoxyethanol.

26. The process of claim 25, wherein depositing the electrode layer comprises spray coating the electrode layer.

27. The process of claim 25, wherein the electrode layer comprises a spray coated silver layer.

28. The process of claim 27, wherein the silver layer is formed from the reaction products of a Tollens' reaction.

29. The process of claim 25, wherein the electrode layer comprises a spray coated layer comprising PEDOT:PSS PH1000.

30. The process of any one of claims 25 to 29, wherein the PEIE layer is spray coated using an aqueous formulation consisting of PEIE and water.

31. The process of any one of claims 25 to 30, wherein the substrate comprises a dielectric layer comprising a cured acrylic urethane clear-coat layer having a surface roughness (Ra) of less than 25 nanometers.

32. The process of any one of claims 25 to 31, wherein the dielectric layer has a surface roughness (Ra) of less than 15 nanometers.