CLAIMS

1. An optical stack, comprising:

an intermediate layer having a first surface and an opposed second surface, the intermediate layer including:

a first hole transport layer forming at least a portion of the first surface;

a first electron transport layer forming at least a portion of

the second surface; and

a metallic nanostructure layer including at least one of: a plurality of metallic nanostructures interposed between the first hole transport layer and the first electron transport layer, a low sheet resistance grid interposed between the first hole transport layer and the first electron transport layer, or combinations thereof;

wherein the plurality of metallic nanostructures comprise a plurality of metallic nanowires and a plurality of metallic nanodots.

2. The optical stack of claim 1, further comprising a first organic photovoltaic device including:

a first active layer having a first surface and a second surface opposed to the first surface, the first active layer sensitive to incoming electromagnetic radiation in a first band of wavelengths;

wherein the first surface of the first active layer is disposed proximate a second electron transport layer; and

wherein the second surface of the first active layer is disposed proximate the first hole transport layer of the intermediate layer.

3. The optical stack of claim 2, further comprising a second organic photovoltaic device including:

a second active layer having a first surface and a second surface opposed to the first surface, the second active layer sensitive to incoming electromagnetic radiation in a second band of wavelengths;

wherein the first surface of the second active layer is disposed proximate a second hole transport layer; and

wherein the second surface of the second active layer is disposed proximate the intermediate layer first electron transport layer.

4. The optical stack of claim 1 wherein the plurality of metallic nanowires comprise a plurality of silver nanowires.

5. The optical stack of claim 1 wherein the plurality of metallic nanodots comprise a plurality of silver nanodots.

6. The optical stack of claim 1 wherein the plurality of metallic nanostructures further comprise at least one of: a plurality of silver nanodots, a plurality of gold nanodots, or a plurality of platinum nanodots.

7. The optical stack of claim 1 wherein the first hole transport layer comprises at least one of: a poly (3,4-ethylenedioxythiophene)/poly(styrenesulfonate) ("PEDOT:PSS") or a tungsten oxide ("WO_3").

8. The optical stack of claim 1 wherein the first electron transport layer comprises a zinc oxide ("ZnO").

9. The optical stack of claim 1 wherein the intermediate layer comprises a layer having at least about 85% transmission of electromagnetic radiation that fall in a range of wavelengths of from about 400 nanometers (nm) to about 600 nm.

10. A method of providing a tandem organic photovoltaic

device, comprising:

forming a first hole transport layer across all or a portion of a surface, the surface including at least a first organic photovoltaic device;

depositing a metallic nanostructure layer including at least one of: a solution including a plurality of metallic nanostructures, a low sheet resistance grid, or combinations thereof across all or a portion of the first hole transport layer;

levelling the deposited metallic nanostructure layer across substantially all of the hole transport layer to provide a levelled metallic nanostructure layer;

forming a first electron transport layer across all or a portion of the levelled metallic nanostructure layer; and

forming a second organic photovoltaic device across all or a portion of the first electron transport layer;

wherein depositing a first electron transport layer across all or a portion of the metallic nanostructure layer includes:

depositing an electron transport material in a substantially uniform thickness across at least a portion of the metallic nanostructure layer, the electron transport material including a zinc oxide ("ZnO") compound.

11. The method of claim 10 wherein depositing the first hole transport layer on the surface including at least the first organic photovoltaic device comprises:

depositing a second electron transfer layer across at least a portion of an indium tin oxide ("ITO") substrate layer that forms at least a portion of the surface;

depositing a first active layer across all or a portion of the second electron transfer layer, the first active layer comprising a poly(3-hexylthiophene-2,5-diyl) ("P3HT") polymer and a phenyl-C61-butyric acid methyl ester ("PCBM") polymer; and

depositing the first hole transport layer across at least a portion of the first active layer.

12. The method of claim 11 wherein depositing the first hole transport layer across at least a portion of the first active layer comprises:

depositing a hole transport material in a substantially uniform thickness across at least a portion of the first active layer, the hole transport material including at least one of: a poly (3,4-ethylenedioxythiophene)/poly(styrenesulfonate) ("PEDOT:PSS") compound or a tungsten oxide ("WO_3") compound.

13. The method of claim 10 wherein depositing a second organic photovoltaic device across all or a portion of the first electron transport layer comprises:

depositing a second active layer across at least a portion of the first electron transport layer, the second active layer comprising a poly(3-hexylthiophene-2,5-diyl) ("P3HT") polymer and a phenyl-C61-butyric acid methyl ester ("PCBM") polymer; and

depositing a second hole transport layer across at least a portion of the second active layer.

14. A tandem organic photovoltaic device, comprising:

an intermediate layer including:

a first hole transport layer;

a first electron transport layer; and

a metallic nanostructure layer including a plurality of metallic nanostructures, the metallic nanostructure layer interposed between the first electron transport layer and the first hole transport layer;

a first organic photovoltaic device including:

a first active layer sensitive to incoming electromagnetic radiation in a first band of wavelengths, the first active layer having a first surface and an opposed second surface, the first surface of the first active layer disposed proximate the first electron transport layer of the intermediate layer;

and

a second hole transport layer disposed proximate all or a portion of the second surface of the first active layer; and

a second organic photovoltaic device conductively coupled to the first organic photovoltaic device and including:

a second active layer sensitive to incoming electromagnetic radiation in a second band of wavelengths that includes at least one electromagnetic radiation wavelength outside of the first band of wavelengths, the second active layer having a first surface and an opposed second surface, the first surface of the second active layer disposed proximate the first hole transport layer of the intermediate layer; and

a second electron transport layer disposed proximate all or a portion of the second surface of the second active layer;

wherein the plurality of metallic nanostructures comprise at least one of: a plurality of silver nanodots, a plurality of gold nanodots, or a plurality of platinum nanodots;

wherein the plurality of metallic nanodots further comprise at least one of: silver nanodots formed at least in part using silver nanowires, gold nanodots formed at least in part using gold nanowires, or platinum nanodots formed at least in part using platinum nanowires.

15. The tandem organic photovoltaic device of claim 14, further comprising:

a first electrode electrically coupled to the second hole transport layer of the first organic photovoltaic device; and

a second electrode electrically communicably coupled to the second electron transport layer of the second organic photovoltaic device.

16. The tandem organic photovoltaic device of claim 15, further comprising:

a third electrode conductively coupled to at least the metallic nanostructure layer.

17. The tandem organic photovoltaic device of claim 14 wherein the plurality of metallic nanostructures further comprise at least one of: a plurality of silver nanowires, a plurality of gold nanowires, or a plurality of platinum nanowires.

18. The tandem organic photovoltaic device of claim 14 wherein the first hole transport layer comprises at least one of: a poly (3,4-ethylenedioxythiophene)/poly(styrenesulfonate) ("PEDOT:PSS") or a tungsten oxide ("WO_3").

19. The tandem organic photovoltaic device of claim 14 wherein the first electron transport layer comprises a zinc oxide ("ZnO").

20. The tandem organic photovoltaic device of claim 14 wherein the intermediate layer comprises a layer having at least about 85% transmission of electromagnetic radiation that falls in a range of wavelengths of from about 400 nanometers (nm) to about 600 nm.