CLAIMS

1. A photovoltaic device comprising at least one nanowire structure fixed to a substrate, wherein each of the at least one nanowire structures comprises:

a heavily doped p-type core having a proximal end fixed to the substrate and a distal end extending away from the substrate; and

a lightly doped n-type shell around the p-type core so as to form a radial p-n junction;

wherein the p-type core is formed of GaAs and the n-type shell is formed of $Al_xGa_{1-x}As$, wherein x has a value of less than or equal to 0.2.

2. The photovoltaic device of claim 1, wherein the doping density of the p-type core is greater than 10^{18} cm^{-3}, preferably 10^{19} cm^{-3}.

3. The photovoltaic device of any of claims 1 or 2, wherein the doping density of the p-type core is greater than or equal to 10^{16} cm^{-3}, and less than 10^{18} cm^{-3}.

4. The photovoltaic device of any preceding claim, wherein the doping density of the n-type shell is less than 10^{17} cm^{-3}, preferably 10^{16} cm^{-3}.

5. The photovoltaic device of any preceding claim, wherein the n-type shell has a thickness of between 20nm and 50nm, and preferably 30nm ; and/or

wherein the diameter of the p-type core is greater than 300nm, and preferably 400nm.

6. The photovoltaic device of any preceding claim, wherein the length of the nanowire is between 5μm and 7μm, and preferably 6μm.

7. The photovoltaic device of any preceding claim, wherein the substrate comprises silicon; and/or

wherein the substrate comprises a graphitic layer.

8. The photovoltaic device of any preceding claim, wherein the distal end of the nanowire comprises an anti-reflection coating.

9. The photovoltaic device of any preceding claim, wherein each of the at least one nanowire structures are coated in a transparent conductive oxide (TCO).

10. The photovoltaic device of any of claims 1 to 8 further comprising a planar TCO contact above the at least one nanowire structures;

wherein, optionally, insulating polymer is disposed between the planar TCO contact and the at least one nanowire structures.

11. The photovoltaic device of claim 1, wherein the p-type core has a radius greater than 300nm, preferably 400nm, and is formed of GaAs with a doping density greater than 10^{18} cm^{-3}, preferably 10^{19} cm^{-3}, the n-type shell has a thickness of less than 50nm, preferably 40nm, and is formed of $Al_{0.2}Ga_{0.8}As$ with a doping density less than 10^{17} cm^{-3}, preferably 10^{16} cm^{-3}, and the nanowire structure has a length of larger than 5μm, preferably between 5μm and 7μm, and more preferably 6μm.

12. A method of fabricating a photovoltaic device comprising at least one nanowire grown on a substrate, the method comprising:

growing a nanowire comprising a heavily doped p-type core having a proximal end fixed to the substrate and a distal end extending away from the substrate, and an n-type shell around the p-type core, such that the fabricated photovoltaic device is a photovoltaic device according to any of claims 1-11.

13. A solar cell comprising a plurality of the photovoltaic devices of any of claims 1 to 11, wherein the plurality of photovoltaic devices are arranged in an array with a packing percentage of greater than 8%, preferably greater than 20%, and more preferably between 50 and 55%.

14. A photovoltaic device comprising at least one nanowire structure fixed to a substrate, wherein each of the at least one nanowire structures comprises:

a planar TCO contact above the at least one nanowire structures, wherein insulating polymer is disposed between the planar TCO contact and the at least one nanowire structures;

a heavily doped p-type core having a proximal end fixed to the substrate and a distal end extending away from the substrate; and

a lightly doped n-type shell around the p-type core so as to form a radial p-n junction.