CLAIMS

What is claimed is:

1) A method of fabricating a solar cell comprising the steps of:

forming a sacrificial layer on a silicon substrate;

forming a doped silicon layer atop the sacrificial substrate;

forming a silicon film atop the doped silicon layer;

forming a plurality of interdigitated contacts on the silicon film;

contacting each of the plurality of interdigitated contacts with a metal contact; and

removing the sacrificial layer.

2) The method of Claim 1, wherein forming the sacrificial layer comprises forming a sacrificial layer composed of silicon and germanium.

3) The method of Claim 1, wherein forming the silicon film comprises epitaxially growing the silicon film.

4) The method of Claim 1, wherein forming the plurality of interdigitated contacts comprises depositing a plurality of dopant sources with an inkjet printer.

5) The method of Claim 1, further comprising texturing the surface of the sacrificial layer prior to forming the doped silicon layer.

6) The method of Claim 5, wherein forming the doped silicon layer comprises forming a layer of doped silicon conforming to the textured surface of the sacrificial layer.

7) The method of Claim 1, further comprising bonding the silicon film to a carrier before removing the sacrificial layer.

8) The method of Claim 7, further comprising the step of debonding the silicon film from the carrier after removing the sacrificial layer.

9) The method of Claim 1, further comprising the step of forming a lightly doped silicon layer between the doped silicon layer and the silicon film.

10) A method of fabricating a solar cell comprising the steps of:

forming a sacrificial layer on a top surface of a silicon substrate;

processing the exposed surface of the sacrificial layer to form a textured surface;

forming a heavily doped silicon layer atop the textured surface of the sacrificial substrate;

forming a lesser doped silicon layer atop the heavily doped silicon layer;

epitaxially growing a silicon film atop the lesser doped silicon layer;

forming an interdigitated contact structure atop the silicon film;

bonding the silicon film to a carrier;

separating the heavily doped silicon layer from the silicon substrate by removing the sacrificial layer;

debonding the silicon film from the carrier; and

forming an anti-reflective coating over the heavily doped silicon layer.

11) The method of Claim 10, wherein epitaxially growing the silicon film comprises epitaxially growing a silicon wafer less than 100 micrometers thick.

12) The method of Claim 10, wherein forming the heavily doped silicon layer comprises forming a silicon layer of less than 2 micrometers thick.

13) The method of Claim 10, wherein the silicon substrate comprises a plurality of sacrificial layers and forming the sacrificial layer comprises doping a top surface of the silicon substrate to form a doped sacrificial layer.

14) The method of Claim 10, wherein forming a sacrificial layer on a top surface of a silicon substrate comprises depositing the sacrificial layer using a CVD process.

15) The method of Claim 10, wherein forming the lesser doped silicon layer comprises driving dopants from the heavily doped silicon layer into the lesser doped silicon layer.

16) A solar cell fabricated by the method of Claim 10.

17) A method of fabricating a solar cell comprising the steps of:

forming a sacrificial layer on a silicon substrate;

forming a doped silicon layer atop the sacrificial substrate;

forming a silicon film atop the doped silicon layer;

forming a plurality of interdigitated contacts on the silicon film; and

separating the doped silicon layer from the silicon substrate.

18) The method of Claim 17, wherein forming the sacrificial layer comprises forming a layer at least partially composed of silicon.

19) The method of Claim 18, wherein separating the doped silicon layer from the silicon substrate comprises exposing the sacrificial layer to a selective etchant.

20) The method of Claim 17, wherein forming the plurality of interdigitated contacts comprises:

forming an oxide layer on the silicon film; and

forming a plurality of doped polysilicon deposits on the oxide layer.

CLAIMS

What is claimed is:

1. A method of fabricating a solar cell comprising the steps of:
forming a sacrificial layer on a silicon substrate;
forming a doped silicon layer atop the sacrificial layer;
forming a silicon film atop the doped silicon layer;
forming an oxide layer on the silicon film;
forming alternating P-type and N-type doped regions on the oxide layer;
contacting each of the P-type and N-type doped regions with a metal contact; and
removing the sacrificial layer and the silicon substrate.

2. The method of claim 1, wherein the sacrificial layer comprises silicon and germanium.

3. The method of claim 1, wherein forming the silicon film comprises epitaxially growing the silicon film.

4. The method of claim 1, wherein the alternating P-type and N-type doped regions are formed using an inkjet printer.

5. The method of claim 1, further comprising texturing the surface of the sacrificial layer prior to forming the doped silicon layer.

6. The method of claim 5, wherein forming the doped silicon layer comprises forming a layer of doped silicon conforming to the textured surface of the sacrificial layer.

7. The method of claim 1, further comprising bonding a back side of the solar cell to a carrier before removing the sacrificial layer.

8. The method of claim 7, further comprising the step of debonding the solar cell from the carrier after removing the sacrificial layer.

9. The method of claim 1, further comprising the step of forming a lightly doped silicon layer between the doped silicon layer and the silicon film.

10. A method of fabricating a solar cell comprising the steps of:
forming a sacrificial layer on a top surface of a silicon substrate;
processing an exposed surface of the sacrificial layer to form a textured surface;
forming a heavily doped silicon layer atop the textured surface of the sacrificial layer;
forming a lesser doped silicon layer atop the heavily doped silicon layer;
epitaxially growing a silicon film atop the lesser doped silicon layer;
forming alternating P-type and N-type doped regions over the silicon film;
contacting each of the P-type and N-type doped regions with a metal contact;
bonding a back side of the solar cell to a carrier;
separating the heavily doped silicon layer from the silicon substrate by removing the sacrificial layer;
debonding the solar cell from the carrier; and
forming an anti-reflective coating over the heavily doped silicon layer.

11. The method of claim 10, wherein epitaxially growing the silicon film comprises epitaxially growing a silicon wafer less than 100 micrometers thick.

12. The method of claim 10, wherein forming the heavily doped silicon layer comprises forming a silicon layer of less than 2 micrometers thick.

13. The method of claim 10, wherein the silicon substrate comprises a plurality of sacrificial layers and forming the sacrificial layer comprises doping a top surface of the silicon substrate to form a doped sacrificial layer.

14. The method of claim 10, wherein the sacrificial layer is deposited on the top surface of the silicon substrate using a CVD process.

15. The method of claim 10, wherein forming the lesser doped silicon layer comprises driving dopants from the heavily doped silicon layer into the lesser doped silicon layer.

16. A solar cell fabricated by the method of claim 10.