We Claim:

1. An aqueous acidic etching solution suitable for texturing the surface of single crystal and polycrystal silicon substrates, the said solution containing, based on the complete weight of the solution,

   - 3 to 10% by weight of hydrofluoric acid;
   - 10 to 35% by weight of nitric acid;
   - 5 to 40% by weight of sulfuric acid; and
   - 55 to 82% by weight of water.

2. The aqueous acidic etching solution of claim 1, characterized in that it contains, based on the complete weight of the solution,

   - 4 to 7% by weight of hydrofluoric acid;
   - 12 to 22% by weight of nitric acid;
   - 12 to 20% by weight of sulfuric acid; and
   - 51 to 72% by weight of water.

3. The aqueous acidic etching solution of claim 1 or 2, characterized in that it contains, based on the complete weight of the solution,

   - 5 to 7% by weight of hydrofluoric acid;
   - 16 to 22% by weight of nitric acid;
   - 15 to 19% by weight of sulfuric acid; and
   - 52 to 64% by weight of water.

4. The aqueous acidic etching solution of claim 1, characterized in that the molar ratio of hydrofluoric acid to nitric acid is from a 3:1 to 1:3.7.

5. The aqueous acidic etching solution of claim 2, characterized in that the molar ratio of hydrofluoric acid to nitric acid is from 1.84:1 to 1:1 .75.

6. The aqueous acidic etching solution of claim 3, characterized in that the molar ratio of hydrofluoric acid to nitric acid is from 1.4:1 to 1:1.4.

7. The aqueous acidic etching solution of of anyone of the claims 1 to 6, characterized in that the molar ratio of hydrofluoric acid to nitric acid is from 1.2:1 to 1:1.2.

8. The aqueous acidic etching solution of anyone of the claims 1 to 7, characterized in that it contains hexafluorosilicic acid.

9. A method for texturing the surface of single crystal and polycrystal silicon substrates comprising the steps of

(1) contacting at least one major surface of a single crystal or polycrystal silicon substrate with an aqueous acidic etching solution containing, based on the complete weight of the solution,

- 3 to 10% by weight of hydrofluoric acid;
- 10 to 35% by weight of nitric acid;
- 5 to 40% by weight of sulfuric acid; and
- 55 to 82% by weight of water;

(2) etching the at least one major surface of a single crystal or polycrystal silicon substrate for a time and at a temperature sufficient to obtain a surface texture consisting of recesses and protrusions; and

(3) removing the at least one major surface of the single crystal or polycrystal silicon substrate from the contact with the aqueous acidic etching solution.

10. The method of claim 9, characterized in that it contains, based on the complete weight of the solution,

- 4 to 7% by weight of hydrofluoric acid;
- 12 to 22% by weight of nitric acid;
- 12 to 20% by weight of sulfuric acid; and
- 51 to 72% by weight of water.

11. The method of claim 9 or 10, characterized in that it contains, based on the complete weight of the solution,
    - 5 to 7% by weight of hydrofluoric acid;
    - 16 to 22% by weight of nitric acid;
    - 15 to 19% by weight of sulfuric acid; and
    - 52 to 64% by weight of water.

12. The method of claim 9, characterized in that the molar ratio of hydrofluoric acid to nitric acid is from a 3:1 to 1:3.7.

13. The method of claim 10, characterized in that the molar ratio of hydrofluoric acid to nitric acid is from 1.84:1 to 1:1 .75.

14. The method of claim 11, characterized in that the molar ratio of hydrofluoric acid to nitric acid is from 1.4:1 to 1:1.4.

15. The method of anyone of the claims 9 to 11, characterized in that the molar ratio of hydrofluoric acid to nitric acid is from 1.2:1 to 1:1.2.

16. The method of anyone of the claims 9 to 15, characterized in that the aqueous acidic etching solution contains hexafluorosilicic acid.

17. The method of anyone other claims 9 to 16, characterized in that the two opposite major surfaces of the single crystal or polycrystal silicon substrate are contacted with the aqueous acidic etching solution in the process step (1).

18. The method of claim 17, characterized in that the contact is effectuated by dipping the single crystal or polycrystal silicon substrate entirely into the aqueous acidic etching solution in the process step (1).

19. The method of anyone other claims 9 to 18, characterized in that the at least one major surface of the single crystal or polycrystal silicon substrate is etched for 1 to 10 minutes at a temperature of from 0 to 50°C in the process step (2).

20. The method of anyone of the claims 9 to 19, characterized in that the surface texture obtained in the process step (2) consists of a multitude of pits having a

depth in the range of from 0.1 to 15 µm and a diameter in the range of from 0.1 to 15 µm

21. The method of anyone of the claims 18 to 19, characterized in that the single crystal polycrystal silicon substrate is entirely removed from the aqueous acidic etching solution in the process step (3).

22. A method for manufacturing devices generating electricity upon the exposure to electromagnetic radiation, characterized in that the aqueous acidic etching solution according to anyone of the claims 1 to 8 and the method for texturing the surface of single crystal and polycrystal silicon substrates according to anyone of the claims 9 to 21 are used.

23. The method of claim 22, characterized in that the devices are photovoltaic cells and solar cells.

24. The method of claim 22 or 23, characterized in that the electromagnetic radiation is solar light.

We claim:

1. An aqueous acidic texturing etching solution, comprising, based on a total weight of the solution:

3 to 10% by weight of hydrofluoric acid;

10 to 35% by weight of nitric acid;

12 to 20% by weight of sulfuric acid; and

47 to 75% by weight of water.

2. The solution of claim **1**, comprising, based on a total weight of the solution:

4 to 7% by weight of hydrofluoric acid;

12 to 22% by weight of nitric acid;

12 to 20% by weight of sulfuric acid; and

51 to 72% by weight of water.

3. The solution of claim **1**, comprising, based on a total weight of the solution:

5 to 7% by weight of hydrofluoric acid;

16 to 22% by weight of nitric acid;

15 to 19% by weight of sulfuric acid; and

52 to 64% by weight of water.

4. The solution of claim **1**, wherein a molar ratio of hydrofluoric acid to nitric acid is from 3:1 to 1:3.7.

5. The solution of claim **2**, wherein a molar ratio of hydrofluoric acid to nitric acid is from 1.84:1 to 1:1.75.

6. The solution of claim **3**, wherein a molar ratio of hydrofluoric acid to nitric acid is from 1.4:1 to 1:1.4.

7. The solution of claim **1**, wherein a molar ratio of hydrofluoric acid to nitric acid is from 1.2:1 to 1:1.2.

8. The solution of claim **1**, further comprising hexafluorosilicic acid.

9. A method for texturing a surface of a single crystal and polycrystal silicon substrate, the method comprising:

(1) contacting a major surface of a single crystal or polycrystal silicon substrate with an aqueous acidic etching solution;

(2) etching the major surface of the single crystal or polycrystal silicon substrate for a time and at a temperature sufficient to obtain a surface texture comprising a recess and a protrusion; and

(3) removing the major surface of the single crystal or polycrystal silicon substrate from the contact with the aqueous acidic etching solution, wherein the solution, comprises, based on a total weight of the solution:

3 to 10% by weight of hydrofluoric acid;

10 to 35% by weight of nitric acid;

5 to 40% by weight of sulfuric acid; and

47 to 82% by weight of water.

10. The method of claim **9**, wherein the solution comprises, based on a total weight of the solution:

4 to 7% by weight of hydrofluoric acid;

12 to 22% by weight of nitric acid;

12 to 20% by weight of sulfuric acid; and

51 to 72% by weight of water.

11. The method of claim **9**, wherein the solution comprises, based on a total weight of the solution:

5 to 7% by weight of hydrofluoric acid;

16 to 22% by weight of nitric acid;

15 to 19% by weight of sulfuric acid; and

52 to 64% by weight of water.

12. The method of claim **9**, wherein a molar ratio of hydrofluoric acid to nitric acid is from 3:1 to 1:3.7.

13. The method of claim **10**, wherein a molar ratio of hydrofluoric acid to nitric acid is from 1.84:1 to 1:1.75.

14. The method of claim **11**, wherein a molar ratio of hydrofluoric acid to nitric acid is from 1.4:1 to 1:1.4.

15. The method of claim **9**, wherein a molar ratio of hydrofluoric acid to nitric acid is from 1.2:1 to 1:1.2.

16. The method of claim **9**, wherein the solution further comprises hexafluorosilicic acid.

17. The method of claim **9**, wherein, during (1), two opposite major surfaces of the single crystal or polycrystal silicon substrate are contacted with the solution.

18. The method of claim **17**, wherein the contacting (1) comprises dipping the single crystal or polycrystal silicon substrate entirely into the solution.

19. The method of claim **9**, wherein, during (2), the major surface of the single crystal or polycrystal silicon substrate is etched for a time of from 1 to 10 minutes at a temperature of from 0 to 50° C.

20. The method of claim **9**, wherein the surface texture comprises a multitude of pits having a depth in the range of from 0.1 to 15μm and a diameter in the range of from 0.1 to 15μm.

21. The method of claim **18**, wherein, during (3), the single crystal polycrystal silicon substrate is entirely removed from the solution.

22. A method for manufacturing a device, comprising employing the method of claim **9**,

wherein the device generates electricity upon exposure to electromagnetic radiation.

23. The method of claim **22**, wherein the device is at least one selected from the group consisting of a photovoltaic cell and solar cell.

24. The method of claim **22**, wherein the electromagnetic radiation is solar light.

25. An aqueous acidic texturing etching solution, comprising, based on a total weight of the solution:

3 to 10% by weight of hydrofluoric acid;

16 to 22% by weight of nitric acid;

5 to 40% by weight of sulfuric acid; and

47 to 76% by weight of water.

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