PATENT CLAIMS

1. Process for the production of solar cells comprising a selective emitter with one-step diffusion, characterised in that a phosphosilicate glass layer (PSG or PSG layer) and an underlying silicon layer are etched in a single etching step with a printed-on etching paste.

2. Process according to Claim 1, characterised in that the formation of the selective emitter is carried out using a phosphoric acid-containing etching paste which etches a phosphosilicate glass layer (PSG or PSG layer) and an underlying silicon layer in a single process step.

3. Process according to one of the preceding Claims 1 or 2, characterised in that the etching of the phosphosilicate glass layer (PSG or PSG layer) and an underlying silicon layer produces a silicon surface having increased microroughness of the actual texture.

4. Process according to one of the preceding Claims 1 or 2, characterised in that, after texturing of the surface of the silicon wafer with a pyramidal or amorphous structure, the surface is treated with a phosphoric acid-containing etching paste, producing increased microroughness of the actual texture.

5. Process according to one or more of the preceding Claims 1 to 4, comprising the following process steps:
   I. Texturing of the surface (with KOH/isopropanol or HF/HNO3)
   II. Phosphorus doping (~35-40 Ω/sq diffusion of $POCl_3$)
   III. Local etching of the PSG and silicon layers, producing a conductivity in the range ~80 – 100 Ω/sq (PSG = phosphosilicate glass), and cleaning
   IV. PSG etching

V. Deposition of the antireflective layer (ARC deposition) by means of plasma enhanced chemical vapour deposition (PECVD) of silicon nitride (SiN_x)

VI. Screen printing for metallisation of the surface (front) and back with subsequent sintering (co-firing)

VII. Edge insulation.

6. Process according to one or more of the preceding Claims 1 to 4, comprising the following process steps:

I. Texturing (in this step, the surface texturing with KOH/isopropanol or HF/HNO_3 is carried out)

II. PSG etching, 40 Ω/sq diffusion ($POCl_3$)

III. PSG etching

IV. Printing-on of Solar Etch®, Si etching, in order to obtain a resistance of 100 Ω/sq and cleaning with deionised water and/or 0.05% KoH solution

V. Deposition of an antireflective coating (ARC) by plasma enhanced chemical vapour deposition (PECVD) for the deposition of silicon nitride (SiN_x)

VI. Screen printing on the front and back for metallisation of the surface on the front and back with subsequent sintering

VII. Edge insulation.

7. Process according to Claim 5 or 6, characterised in that the cleaning is carried out with deionised water and/or 0.05% KOH solution.

8. Process according to Claims 5 to 7, characterised in that back edge insulation is additionally carried out by an etching step.

9. Use of a phosphoric acid-containing etching paste for the production of solar cells comprising a selective emitter with one-step diffusion.

10. Use of a phosphoric acid-containing etching paste in a process according to one or more of Claims 1 -- 6 for the production of solar cells comprising a selective emitter.

11. Phosphoric acid-containing etching paste for use according to one of Claims 9 or 10, characterised in that the paste comprises phosphoric acid in an amount of 25 to 80% by weight.

12. Phosphoric acid-containing etching paste according to Claim 11, comprising a solvent or solvent mixture in an amount of 20 to 40% by weight.

13. Phosphoric acid-containing etching paste according to Claim 11 or 12, comprising a solvent selected from the group glycerol, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, dimethyl sulfoxide and gamma-butyrolactone in pure form or as a mixture.

14. Phosphoric acid-containing etching paste according to one or more of Claims 11 to 13, comprising at least one non-particulate thickener.

15. Phosphoric acid-containing etching paste according to one or more of Claims 11 to 14, comprising a non-particulate thickener selected from the group polyvinylpyrrolidone and hydroxypropylcellulose in pure form or as a mixture.

16. Phosphoric acid-containing etching paste according to one or more of Claims 11 to 15, comprising a particulate thickener selected from the group carbon black and low-melting wax particles, in pure form or as a mixture.

17. Phosphoric acid-containing etching paste according to one or more of Claims 11 to 16, comprising a thickener in an amount of 20 – 35% by weight.

The invention claimed is:

1. A process for production of solar cells comprising a selective emitter with one-step diffusion, said process comprising: etching in a single etching step a phosphosilicate glass layer and an underlying silicon layer with a printed-on etching paste.

2. The process according to claim 1, wherein said etching provides is and wherein said etching paste is a phosphoric acid-containing etching paste.

3. The process according to claim 1, wherein the etching of said phosphosilicate glass layer and said underlying silicon layer produces a silicon surface having increased microroughness of the actual texture.

4. The process according to claim 1, wherein said etching of said phosphosilicate glass layer and underlying silicon layer is performed after the surface of the silicon layer is textured with a pyramidal or amorphous structure, and said etching produces increased microroughness of the actual texture of said surface of the silicon layer.

5. The process according to claim 1, comprising the following process steps: I. Texturing of the surface of said silicon layer with KOH/isopropanol or HF/HNO3; II. Phosphorus doping (˜35-40 Ω/sq diffusion of $POCl_3$); III. Local etching of the phosphosilicate glass layer and underlying silicon layer, producing a conductivity in the range ˜80-100 Ω/sq, and cleaning; IV. phosphosilicate glass etching; V. Deposition of the antireflective layer by means of plasma enhanced chemical vapor deposition of silicon nitride (SiN_x); VI. Screen printing for metallization of the surface (front) and back with subsequent sintering (co-firing); and VII. Edge insulation.

6. The process according to claim 1, comprising the following process steps: I. Texturing of the surface of said silicon layer with KOH/isopropanol or HF/HNO_3; II. phosphosilicate glass etching, 40 Ω/sq diffusion ($POCl_3$); III. phosphosilicate glass etching; IV. Printing-on of Solar Etch®, Si etching, in order to obtain a resistance of 100 Ω/sq and cleaning with deionised water and/or 0.05% KoH solution; V. Deposition of an antireflective coating by plasma enhanced chemical vapor deposition for the deposition of silicon nitride (SiN_x); VI. Screen printing on the front and back for metallization of the surface on the front and back with subsequent sintering; and VII. Edge insulation.

7. The process according to claim 5, wherein cleaning is carried out with deionised water and/or 0.05% KOH solution.

8. The process according to claim 5, wherein back edge insulation is additionally carried out by an etching step.

9. The process of claim 1, wherein the etching paste is a phosphoric acid-containing etching paste.

10. A solar cell comprising a selective emitter prepared by the process according to claim 2.

11. The process of claim 9, wherein said etching paste comprises phosphoric acid in an amount of 25 to 80% by weight.

12. The process according to claim 11, wherein said etching paste comprising a solvent or solvent mixture in an amount of 20 to 40% by weight.

13. The process of claim 12, wherein said solvent is selected from glycerol, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, dimethyl sulfoxide and gamma-butyrolactone, in each case in pure form or as a mixture.

14. The process of claim 11, wherein said etching paste comprises at least one non-particulate thickener.

15. The process of claim 11, wherein said etching paste comprises a non-particulate thickener selected from polyvinylpyrrolidone and hydroxypropylcellulose, in each case in pure form or as a mixture.

16. The process of claim 11, wherein said etching paste comprises a particulate thickener selected from carbon black and low-melting wax particles, in each case in pure form or as a mixture.

17. The process of claim 11, wherein said etching paste comprises a thickener in an amount of 20 -35% by weight.