PATENT CLAIMS

1. Process for the production of solar cells having a local back surface field (LBSF), characterised in that a phosphosilicate glass layer (PSG or PSG layer) and an underlying silicon layer are etched in one etching step using a printed-on etching paste, and the back surface polishing and the back surface edge insulation are thereby carried out in one process step with the aid of an alkaline etching paste.

2. Process according to Claim 1, characterised in that the back surface polishing and the back surface edge insulation is carried out by means of an alkaline etching paste which comprises, as etching component, NaOH, KOH or mixtures thereof, and which etches a phosphosilicate glass layer (PSG or PSG layer) and an underlying silicon layer in one process step.

3. Process according to Claim 1 or 2, characterised in that contact windows are etched into the back surface multilayer (passivation layer and SiNx) of the wafer using an acidic etching paste which has particular selectivity for silicon layers.

4. Process according to one of the preceding Claims 1, 2 or 3 comprising the process steps:
   I. Texturing of the surface
   II. Phosphorus doping (~65Ω/sq diffusion of $POCl_3$
   III. Etching of the back surface by means of an alkaline etching paste, by means of which the surface is polished and at the same time the p/n junction is opened, where the etching paste is printed onto the back surface using stencil printing, the paste is activated in a belt furnace at about 150°C for 5 min, and the wafer is subsequently rinsed with DI water,
   IV. Coating of the back surface with an SiO2 or Al2O3 passivation layer having a thickness of 15-30nm and subsequent coating of the back surface and front surface with silicon nitride (70-100nm) by means of plasma enhanced chemical vapour deposition (PECVD - SiN_x)

V. Printing-on of the etching paste by means of screen printing, heating in the belt furnace and rinsing with DI water.

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

5. Use of an alkaline etching paste in a process according to one of Claims 1 or 2, characterised in that the paste comprises the alkaline etching component, selected from the group NaOH, KOH and mixtures thereof, in an amount of 5 to 40% by weight.

6. Use of a KOH-containing etching paste according to Claim 5, comprising solvents selected from the group glycerol, ethylene glycol, polyethylene glycol, octanol, 1,3-propanediol, 1,4-butanediol, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, dimethyl sulfoxide and gamma-butyrolactone, in pure form or in a mixture.

7. Use of a KOH-containing etching paste according to Claim 5 or 6, comprising at least one non-particulate thickener.

8. Use of a KOH-containing etching paste according to one or more of Claims 5 to 7, comprising a non-particulate thickener selected from the group polyvinylpyrrolidone, polyacrylates, carboxymethylcellulose and hydroxypropylcellulose in pure form or in a mixture.

9. Use of a KOH-containing etching paste according to one or more of Claims 5 to 8, comprising a particulate thickener selected from the group carbon black, pyrogenic silicic acid, magnesium aluminium silicates and low-melting wax particles in pure form or in a mixture.

10. Use of a KOH-containing etching paste according to one or more of Claims 5 to 9, comprising thickeners in an amount of 0.1 – 35% by weight.

11. Use of a KOH-containing etching paste in a process according to one or more of Claims 1 to 4 for the production of solar cells having an LBSF.

12. Use of a phosphoric acid-containing etching paste in a process according to one or more of Claims 1 to 4 for the production of solar cells having an LBSF for opening the back surface passivation layer.

CLAIMS

1 Process for the production of solar cells having a local back surface field (LBSF), wherein a phosphosilicate glass layer (PSG or PSG layer) and an underlying silicon layer are etched in one etching step using a printed-on etching paste, and wherein the back surface polishing and the back surface edge insulation are simultaneously carried out with the aid of an alkaline etching paste.

2 Process according to Claim 1, characterised in that the back surface polishing and the back surface edge insulation is carried out by means of an alkaline etching paste which comprises, as etching component, NaOH, KOH or mixtures thereof, and which etches a phosphosilicate glass layer (PSG or PSG layer) and an underlying silicon layer in one process step.

3 Process according to Claim 1 or Claim 2, characterised in that contact windows are etched into the back surface multilayer (passivation layer and SiNx) of the wafer using an acidic etching paste which is selective for silicon layers.

4 Process according to any one of the preceding Claims, comprising the process steps:

I. Texturing of the surface

II. Phosphorus doping (~650Ω/sq diffusion of $POCl_3$)

III. Etching of the back surface by means of an alkaline etching paste, by means of which the surface is polished and at the same time the p/n junction is opened, where the etching paste is printed onto the back surface using stencil printing, the paste is activated in a belt furnace at about 150°C for 5 min, and the wafer is subsequently rinsed with DI water,

IV. Coating of the back surface with an $Si0_2$ or Al_2O_3 passivation layer having a thickness of 15-30nm and subsequent coating of the back surface and front surface with silicon nitride (70-100nm) by means of plasma enhanced chemical vapour deposition (PECVD -SiN_x)

V. Printing-on of the etching paste by means of screen printing, heating in the belt furnace and rinsing with DI water.

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

5. Use of an alkaline etching paste in a process according to Claim 1 or Claim 2, characterised in that the paste comprises the alkaline etching component, selected from the group NaOH, KOH and mixtures thereof, in an amount of 5 to 40% by weight.

6. Use of a KOH-containing etching paste according to Claim 5, comprising solvents selected from the group glycerol, ethylene glycol, polyethylene glycol, octanol, 1,3-propanediol, 1 ,4-butanediol, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, dimethyl sulfoxide and gamma-butyrolactone, in pure form or in a mixture.

7. Use of a KOH-containing etching paste according to Claim 5 or Claim 6, comprising at least one non-particulate thickener.

8. Use of a KOH-containing etching paste according to any one of Claims 5 to 7, comprising a non-particulate thickener selected from the group polyvinylpyrrolidone, polyacrylates, carboxymethylcellulose and hydroxypropylcellulose in pure form or in a mixture.

9. Use of a KOH-containing etching paste according to any one of Claims 5 to 8, comprising a particulate thickener selected from the group carbon black, pyrogenic silicic acid, magnesium aluminium silicates and low-melting wax particles in pure form or in a mixture.

10. Use of a KOH-containing etching paste according to any one of Claims 5 to 9, comprising thickeners in an amount of 0.1 – 35% by weight.

11. Use of a KOH-containing etching paste in a process according to any one of Claims 1 to 4, for the production of solar cells having an LBSF.

12. Use of a phosphoric acid-containing etching paste in a process according to any one of Claims 1 to 4, for the production of solar cells having an LBSF for opening the back surface passivation layer.