

Claims

1. Solar cell string (2) for use in a photovoltaic module (1), the string (2) comprising
 - (i) a string (2) of at least two solar cells (3a, 3b) shingled in string direction, resulting in positive and negative electrode overlap (4),
 - (ii) at least one interconnect (5) for electrically connecting the positive and negative electrodes of the shingled solar cells (3a, 3b), and
 - (iii) at least one thermoadhesive foil (6) spanning at least part of the string and positioned on
 - a. the top side of one solar cell (3a) and on the bottom side of the overlapping solar cell (3b),wherein the thermoadhesive foil (6) comprises the at least one interconnect (5) and connects the overlap (4),
thereby mechanically connecting and positioning the shingled solar cells (3a, 3b) of the string (2).
2. The solar cell string (2) of claim 1, wherein the interconnect (5) is a thermoadhesive electrically conductive foil (6) selected from the group consisting of thermoadhesive foils comprising electrically conductive elements, preferably metal wires, more preferably metal wires coated with solderable material, preferably with Ag-, Sn-, SnBi, In-comprising solder.
3. The solar cell string (2) of claims 1 or 2, wherein the overlap (4) comprises a non- or less photovoltaically active zone (7) of the at least two solar cells (3a, 3b).
4. The solar cell string (2) of any of claims 1 to 3, wherein the interconnect (5) is a or forms part of a busbar (8) receiving solar cell fingers (9) arranged in string direction, preferably receiving 2 to 20 solar cell fingers per cm, more preferably 5 to 15 solar cell fingers per cm.
5. The solar cell string (2) of any of claims 1 to 4, wherein the thermoadhesive foil (6) is or comprises a polymer foil, preferably selected from the group consisting of duroplasts, preferably EVAs (ethylene vinyl acetates), TPSEs (thermoplastic silicone elastomers), TPUs (thermoplastic polyurethanes), PETs (polyethylene terephthalates), TPOs (thermoplastic polyfin elastomers), ionomers, thermoplasts; preferably PVBs (polyvinylbutyrals), silicones, polyolefins (PO), PPs (polypropylenes); and combinations of thermoduoplasts, more preferably a polymer foil thermoadhesive at temperatures in the range of 50 to 250 °C, preferably in the range of 60 to 200 °C, more preferably in the range of 75 to 175 °C.
6. The solar cell string (2) of any of claims 1 to 5, wherein the thermoadhesive foil (6) is positioned on the top side of one solar cell (3a) and on the bottom side of the overlapping solar cell (3b), wherein the thermoadhesive foil (6) comprises at least one electrically conductive element (10), preferably a metal wire.

7. Method for the production of a solar cell string (2) according to any of claims 1 to 6, comprising the steps of:
 - (a) providing at least two solar cells (3a, 3b) comprising overlap (4) regions for forming a shingled solar cell string (2),
 - (b) providing at least one thermoadhesive foil (6) comprising an interconnect (5) for electrically connecting the positive and negative electrodes of the shingled solar cells (3a, 3b),
 - (c) positioning and connecting a first solar cell (3a) to the thermoadhesive foil (6),
 - (d) positioning and connecting the interconnect (5) material on a first electrode region of the first solar cell (3a),
 - (e) positioning and connecting a second solar cell (3b) to the thermoadhesive foil (6) in string direction so that the first and second solar cells (3a, 3b) overlap in shingle arrangement, resulting in positive and negative electrode overlap (4),
 - (f) optionally positioning and connecting the interconnect (5) material on a further electrode of the second or further solar cell (3b, 3c) and positioning and connecting a third or further solar cell (3c) to the thermoadhesive foil (6) in string direction so that the first, second and further solar cells (3a, 3b, 3c) all overlap in shingle arrangement resulting in positive and negative electrode contact,
 - (g) electrically connecting the positive and negative electrodes of the shingled solar cells (3a, 3b, 3c), preferably in the overlap (4) regions, of the first, second or further solar cells (3a, 3b, 3c) after step (f) or after optional step (g),
 wherein
 the shingled solar cell string (2) prepared by steps (a) to (e) or (a) to (f) is electrically and mechanically connected, preferably in the overlap (4) regions, at the time of assembly of a photovoltaic module (1), thus allowing for more flexibility for handling and transport until the time of assembly.
8. The method of claim 7, wherein the interconnect (5) is a thermoadhesive electrically conductive foil (6) selected from the group consisting of thermoadhesive foils comprising electrically conductive elements, preferably metal wires, more preferably metal wires coated with solderable material, preferably with Ag-, Sn-, SnBi, In-comprising solder.
9. The method of claim 7 or 8, wherein the overlap (4) comprises the non- or less photovoltaically active zone (7) of the at least two solar cells (3a, 3b).
10. The method of any of claims 7 to 9, wherein the interconnect (5) is a or forms part of a busbar (8) receiving solar cell fingers (9) arranged in string direction, preferably receiving 2 to 20 solar cell fingers per cm, more preferably 5 to 15 solar cell fingers per cm.

11. The method of any of claims 7 to 10, wherein the thermoadhesive foil (6) is or comprises a polymer foil, preferably selected from the group consisting of duroplasts, preferably EVAs (ethylene vinyl acetates), TPSEs (thermoplastic silicone elastomers), TPUs (thermoplastic polyurethanes), PETs (polyethylene terephthalates), TPOs (thermoplastic polyfin elastomers), ionomers, thermoplasts; preferably PVBs (polyvinylbutyrals), silicones, polyolefins (PO), PPs (polypropylenes); and combinations of thermopduoplasts, more preferably a polymer foil thermoadhesive at temperatures in the range of 50 to 250 °C, preferably in the range of 60 to 200 °C, more preferably in the range of 75 to 175 °C.
12. The method of any of claims 7 to 11, wherein the adhesive foil (6) is positioned on the top side of one solar cell (3a) and on the bottom side of the overlapping solar cell (3b), wherein the adhesive foil (6) comprises at least one, preferably more electrically conductive elements (10), preferably metal wires.