

ORIGINAL

ABSTRACT

**"HIGHLY-CONDUCTIVE AND TEXTURED FRONT TRANSPARENT
ELECTRODE FOR A-SI THIN-FILM SOLAR CELLS, AND/OR METHOD OF
MAKING THE SAME"**

5139 DELNP 12
11 JUN 2012

Certain example embodiments incorporate a "hybrid" design for the front electrode of solar cells, which advantageously combines naturally textured pyrolytic tin oxide and highly-conductive sputtered indium tin oxide (ITO). In certain example embodiments of this invention, a method of making a front electrode superstrate for a solar cell is provided. A glass substrate is provided. A layer of tin oxide is pyrolytically deposited on the glass substrate, with the layer of tin oxide being textured as a result of the pyrolytic deposition and with the layer of tin oxide being haze producing. A layer of indium tin oxide (ITO) is sputter-deposited on the layer of tin oxide, with the layer of ITO being generally conformal with respect to the layer of tin oxide. An amorphous silicon (a-Si) thin film layer stack is formed on the layer of ITO in making the front electrode superstrate.

WHAT IS CLAIMED IS:

1. A method of making a front electrode superstrate for a solar cell, the method comprising:
 - providing a glass substrate;
 - pyrolytically depositing a layer of tin oxide on the glass substrate, the layer of tin oxide being textured as a result of the pyrolytic deposition and being haze producing;
 - sputter-depositing a layer of indium tin oxide (ITO) on the layer of tin oxide, the layer of ITO being generally conformal with respect to the layer of tin oxide; and
 - forming an amorphous silicon (a-Si) thin film layer stack on the layer of ITO in making the front electrode superstrate.
2. The method of claim 1, wherein the layer of tin oxide is not doped.
3. The method of claim 2, wherein the layer of tin oxide is non-conductive compared to the layer of ITO.
4. The method of claim 2, wherein the pyrolytic depositing of the tin oxide is performed via an in-line process.
5. The method of claim 1, wherein the layer of tin oxide is fluorine-doped tin oxide.
6. The method of claim 5, further comprising texturing the layer of fluorine-doped tin oxide.
7. The method of claim 6, wherein the texturing is performed by chemical etching.
8. The method of claim 6, wherein the texturing is performed by ion-beam roughening.

17. A solar cell, comprising the front electrode superstrate of claim 16.
18. A method of making a front electrode superstrate for a solar cell, the method comprising:
- providing a glass substrate;
 - pyrolytically depositing a layer of tin oxide on the glass substrate, the layer of tin oxide being textured as a result of the pyrolytic deposition and being haze producing;
 - disposing at least one highly conductive layer on the layer of tin oxide, the at least one highly conductive layer being generally conformal with respect to the layer of tin oxide; and
 - forming an amorphous silicon (a-Si) thin film layer stack on the at least one highly conductive layer in making the front electrode superstrate,
- wherein the at least one highly conductive layer comprises ITO, Ag, indium zinc oxide, AZO, indium gallium zinc oxide, and/or indium gallium oxide.
19. The method of claim 18, wherein the at least one highly conductive layer is sputter-deposited.
20. The method of claim 18, wherein each step in the method is performed in-line.

Dated this the 11th day of June 2012.



(ASHISH K. SHARMA)
Of SUBRAMANIAM, NATARAJ & ASSOCIATES
Attorneys for the Applicants

5139 DELNP 12
11 JUN 2012

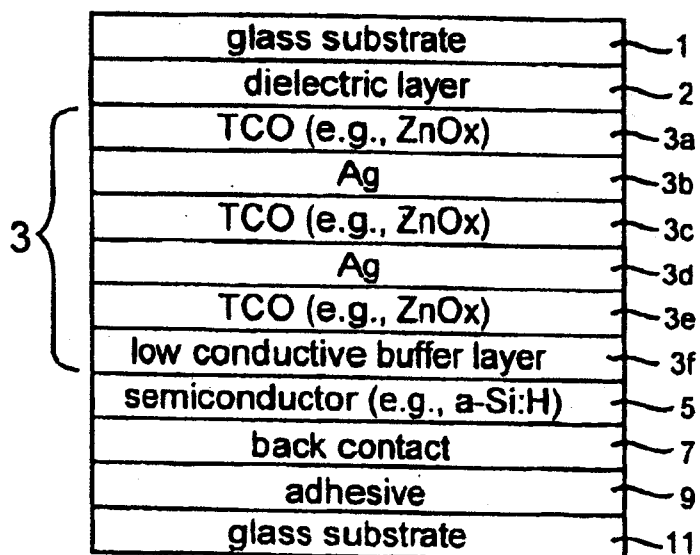
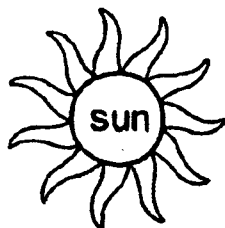


Fig. 1

5139 DEWP 12
1 JUN 2012

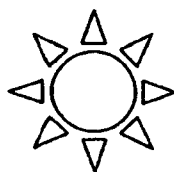
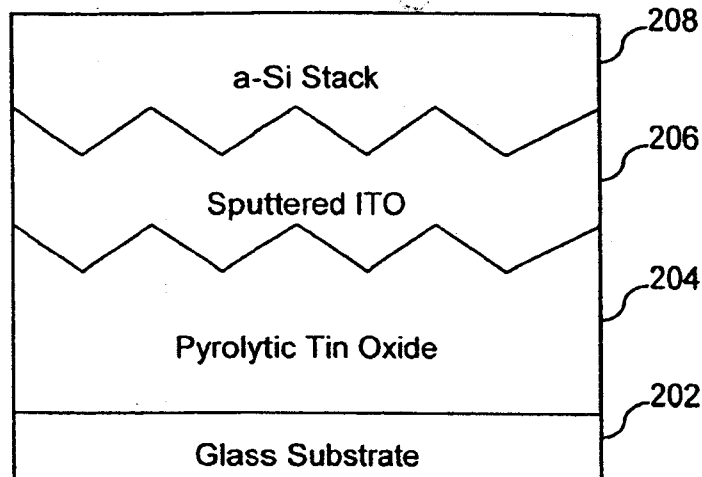


Fig. 2

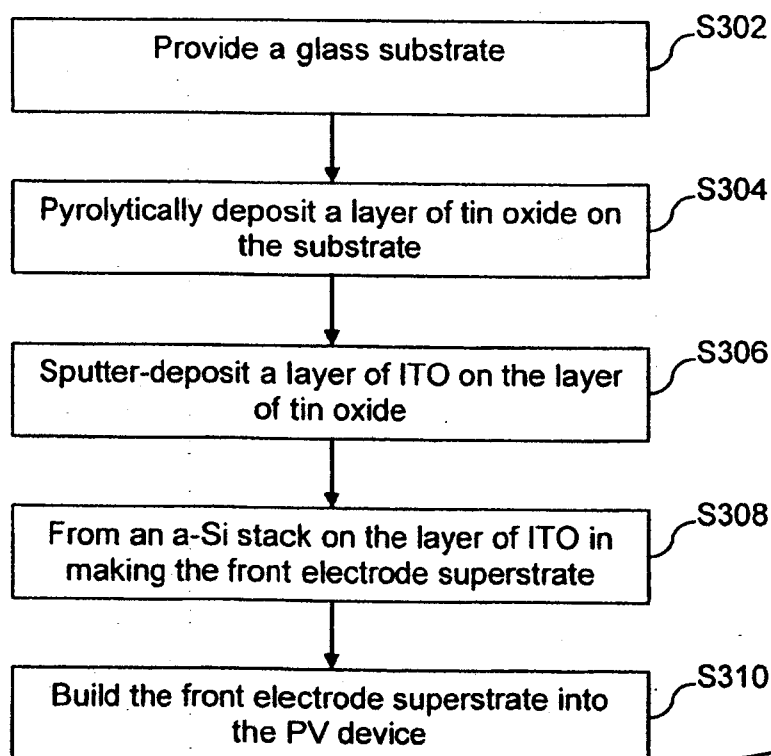


Fig. 3