PHOTOVOLTAIC CELL AND LAMINATE METALLIZATION

TECHNICAL FIELD

[0001] Embodiments of the subject matter described herein relate generally to photovoltaic assemblies including solar cells, photovoltaic laminates and photovoltaic modules. More particularly, embodiments of the subject matter relate to photovoltaic laminates and fabrication processes.

BACKGROUND

[0002] Solar cells are well known devices for converting solar radiation to electrical energy. They can be fabricated on a semiconductor wafer using semiconductor processing technology. A photovoltaic cell or a cell includes P-type and N-type diffusion regions. Solar radiation impinging on the solar cell creates electrons and holes that migrate to the diffusion regions, thereby creating voltage differentials between the diffusion regions. In a backside contact solar cell, both the diffusion regions and the metal contact fingers coupled to them are on the backside of the solar cell. The contact regions and contact fingers allow an external electrical circuit to be coupled to and be powered by the solar cell. Solar cells can be packaged into a photovoltaic laminate using various processes and encapsulant materials, where photovoltaic laminates can be further packaged to into a photovoltaic module. One or more embodiments pertain to photovoltaic cells or solar cells and photovoltaic laminate fabrication processes.

BRIEF SUMMARY

[0003] A photovoltaic laminate is disclosed. The photovoltaic laminate can include a substantially transparent layer, a first encapsulant layer on the substantially transparent layer, a solar cell and a metal foil on the solar cell. Embodiments can include a metal bond coupling the metal foil to the first solar cell. In some embodiments, the metal bond can include a metal contact region. Embodiments can also include a backing material on the metal foil and a back layer on the backing material.

[0004] According to an aspect of the invention, a~~A~~ method for metallization for a photovoltaic laminate is disclosed. The method ~~can~~ includes placing a first encapsulant on a substantially transparent layer. The

method ~~can~~ also includes placing a first solar cell on the first encapsulant. The method ~~can~~ includes placing a metal foil on the first solar cell, where the metal foil uniformly contacts the first solar cell and forming a metal bond that couples the metal foil to the first solar cell. The method can further include placing a backing material on the metal foil, forming a back layer on the backing material and bonding the substantially transparent layer, first encapsulant, first solar cell, metal foil, backing material and back layer to form a photovoltaic laminate.

[0005] According to another aspect of the invention ~~Another~~ another method for metallization of a photovoltaic laminate is disclosed~~.~~, the photovoltaic laminate having a front side which faces the sun during normal operation and a back side opposite the front side, the method comprising placing a first encapsulant on a substantially transparent layer that comprises the front side of the photovoltaic laminate; placing a first solar cell on the first encapsulant; placing a metal foil on the first solar cell, wherein the metal foil uniformly contacts a back side of the first solar cell; forming a metal bond that couples the metal foil to the first solar cell; placing a backing material on the metal foil; forming a back layer on the backing material layer; and curing the substantially transparent layer, first encapsulant, first solar cell, metal foil, backing material and back layer to form a photovoltaic laminate. According to another aspect of the invention another method for metallization of photovoltaic laminate is provided ~~The~~ the method ~~can~~ includes placing a metal foil on a receiving medium placing a first solar cell of the metal foil and forming a metal bond that couples the metal foil to the first solar cell. In some embodiments the receiving medium can include a receiving medium selected from the group composed of a substantially transparent layer, sacrificial glass and a perforated medium. The method can include placing a first solar cell on the metal foil. The method can include forming a metal bond that couples the metal foil to the first solar cell. In an embodiment, forming a metal bond can include firing a laser through the receiving medium to the metal foil to form a metal bond or a metal contact region that couples the metal foil to the first solar cell. The method can further include placing a first encapsulant on the first solar cell and placing a substantially transparent layer on the first

encapsulant. The method can also include placing a backing material on the metal foil, placing a back layer on the backing material and bonding the substantially transparent layer, first encapsulant, first solar cell, metal foil, backing material and back layer together forming a photovoltaic laminate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] A more complete understanding of the subject matter may be derived by referring to the detailed description and claims when considered in conjunction with the following figures, wherein like reference numbers refer to similar elements throughout the figures.

[0007] FIGS. 1-7 are cross-sectional representations of a photovoltaic laminate in accordance with a presented method for metallization of a photovoltaic laminate;

[0008] FIGS. 8-15 are cross-sectional representations of a photovoltaic laminate in accordance with another presented method for metallization of a photovoltaic laminate;

[0009] FIGS. 16-23 are schematic plan views of a solar cell in accordance with the presented methods of FIGS. 1-15 for metallization of a photovoltaic laminate; and