PASSIVATION OF LIGHT-RECEIVING SURFACES OF SOLAR CELLS WITH CRYSTALLINE SILICON

TECHNICAL FIELD

[0001] Embodiments of the present disclosure are in the field of renewable energy and, in particular, methods of passivating light-receiving surfaces of solar cells with crystalline silicon, and the resulting solar cells.

BACKGROUND

[0002] Photovoltaic cells, commonly known as solar cells, are well known devices for direct conversion of solar radiation into electrical energy. Generally, solar cells are fabricated on a semiconductor wafer or substrate using semiconductor processing techniques to form a p-n junction near a surface of the substrate. Solar radiation impinging on the surface of, and entering into, the substrate creates electron and hole pairs in the bulk of the substrate. The electron and hole pairs migrate to p-doped and n-doped regions in the substrate, thereby generating a voltage differential between the doped regions. The doped regions are connected to conductive regions on the solar cell to direct an electrical current from the cell to an external circuit coupled thereto.

[0003] Efficiency is an important characteristic of a solar cell as it is directly related to the capability of the solar cell to generate power. Likewise, efficiency in producing solar cells is directly related to the cost effectiveness of such solar cells. Accordingly, techniques for increasing the efficiency of solar cells, or techniques for increasing the efficiency in the manufacture of solar cells, are generally desirable. Some embodiments of the present disclosure allow for increased solar cell manufacture efficiency by providing novel processes for fabricating solar cell structures. Some embodiments of the present disclosure allow for increased solar cell efficiency by providing novel solar cell structures.

Summary

[0003a] According to a first aspect, a solar cell is provided, comprising:

a silicon substrate having a light-receiving surface;

an intrinsic silicon layer disposed above the light-receiving surface of the silicon substrate; and

an N-type silicon layer disposed on the intrinsic silicon layer, wherein one or both of the intrinsic silicon layer and the N-type silicon layer is a micro- or poly-crystalline silicon layer.

[0003b] According to a second aspect, a solar cell is provided, comprising:

a silicon substrate having a light-receiving surface;

a passivating dielectric layer disposed on the light-receiving surface of the silicon substrate; and

an N-type micro- or poly-crystalline silicon layer disposed on the passivating dielectric layer.

[0003b] According to a third aspect, a method of fabricating a solar cell is provided, comprising:

forming a passivating dielectric layer on a light-receiving surface of a silicon substrate;

forming an N-type micro- or poly-crystalline silicon layer above the passivating dielectric layer; and

forming an anti-reflective coating (ARC) layer on the N-type micro- or poly-crystalline silicon layer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Figures 1A-1E illustrate cross-sectional views of various stages in the fabrication of a solar cell, in accordance with an embodiment of the present disclosure, wherein:

[0005] Figure 1A illustrates a starting substrate of a solar cell;

[0006] Figure 1B illustrates the structure of Figure 1A following formation of a passivating dielectric layer on a light-receiving surface of the substrate;

[0007] Figure 1C illustrates the structure of Figure 1B following formation of an intrinsic silicon layer on the passivating dielectric layer;