Seed Layer for Solar Cell Conductive Contact

TECHNICAL FIELD

[0001] Embodiments of the present invention are in the field of renewable energy and, in particular, seed layers for solar cell conductive contacts and methods of forming seed layers for solar cell conductive contacts.

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 invention allow for increased solar cell manufacture efficiency by providing novel processes for fabricating solar cell structures. Some embodiments of the present invention allow for increased solar cell efficiency by providing novel solar cell structures.

SUMMARY OF INVENTION

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

a substrate, an emitter region disposed above the substrate and a conductive contact disposed on the emitter region and comprising a conductive layer in contact with the emitter region, the conductive layer comprising aluminum/silicon (Al/Si) particles having a composition consisting essentially of greater than approximately 15% Si with the remainder Al.

[0003b] According to the second aspect of the invention, a solar cell is provided, comprising a substrate having a diffusion region at or near a surface of the substrate; and a conductive contact disposed above the diffusion region and comprising a conductive layer in contact with the substrate, the conductive layer comprising aluminum/silicon (Al/Si) particles having a composition consisting essentially of greater than approximately 15% Si with the remainder Al.

[0003c] According to the third aspect of the invention, a partially fabricated solar cell is provided, comprising a substrate, an emitter region disposed in or above the substrate and a conductive contact disposed on a silicon region of the emitter region and comprising a conductive layer in contact with the silicon region, the conductive layer comprising aluminum/silicon (Al/Si) particles having a composition consisting of a sufficient amount of Si such that the conductive layer does not consume a significant portion of the silicon region during an anneal of the conductive layer, with the remainder Al.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Figure 1 is a plot of photoluminescence (PL) mid-point post-fire as a function of target silicon (Si) content within a paste additive, in accordance with an embodiment of the present invention.

[0005] Figure 2A is a scanning electron microscopy (SEM) image of a silicon substrate following firing of a seed paste having 15% silicon relative to aluminum therein, in accordance with an embodiment of the present invention.

[0006] Figure 2B is an SEM image of a silicon substrate following firing of a seed paste having 25% silicon relative to aluminum therein, in accordance with an embodiment of the present invention.