Dopant Ink Composition and Method of Fabricating a Solar Cell There From

[0001] The invention described herein was made with Governmental support under contract number DE-FC36-07GO17043 awarded by the United States Department of Energy. The Government may have certain rights in the invention.

TECHNICAL FIELD

[0002] Embodiments of the present invention are in the field of renewable energy and, in particular, dopant ink compositions and methods of fabricating solar cells there from.

BACKGROUND

[0003] 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 tire 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

[0004] 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. Embodiments of die present invention allow for increased solar cell manufacture efficiency by providing novel processes for fabricating solar cell structures.

SUMMARY

[0004a] According to a first aspect, there is provided a dopant ink composition, comprising: a cross-linkable matrix precursor; a bound dopant species; and a solvent.

[0004b] According to a second aspect, there is provided a dopant ink composition, comprising: a cross-linkable matrix precursor; a plurality of particles; a dopant species coupled to one of the particles; and a solvent.

[0004c] According to a third aspect, there is provided a method of fabricating a solar cell, the method comprising: delivering a dopant ink composition to a region above a substrate, the dopant ink composition comprising a cross-linkable matrix precursor, a bound dopant species, and a solvent; baking the dopant ink composition to remove a substantial portion of the solvent of the dopant ink composition; curing the baked dopant ink composition to cross-link a substantial portion of the cross-linkable matrix precursor of the dopant ink composition; and driving dopants from the cured dopant ink composition toward the substrate.

[0004d] According to a fourth aspect, there is provided a solar cell fabricated according to the third aspect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Figure 1A is a schematic diagram of a dopant ink composition, in accordance with an embodiment of the present invention.