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Dual-Scale Silicon Surface Texturing by Reactive-ion Etching with Silica Bead Lithography Technique

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Inventors

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Background

For the cost of silicon solar modules to continue their path toward cost reduction and grid parity, new methods of cost reduction are needed. Currently, silicon solar cells wafers are manufactured 300 to 400 um thick. Cells can operate effectively at only 80 um thick, and the technology exists to manufacture cells at this thickness. Cells are etched and coated with anti-reflection coatings to enhance light trapping. Unfortunately, current manufacturing methods still allow significant light reflection from the surface, due to the large texture size and high aspect ratio structure. These methods are even more inadequate for use with thin wafers solar cells because of the large amount of material that is removed during application. Reduction in the quantity of silicon used by 75% with adequate light trapping techniques would significantly reduce the cost of solar modules, and at the same time improve their efficiency.

Invention Description

Researchers at Arizona State University have developed a new dual-scale texturing process that can provide both a high level of light trapping and anti-reflection coating effects. First, a silica bead is deposited on the surface of the cell. Then the process uses a simple, low cost reactive ion etching system. The process works well with thin silicon cells as little cell material is removed. The cells light trapping and anti-reflective effect is improved over methods currently used in production of solar cells. Overall solar cell efficiency is improved, and at the same time thinner cells reduce the amount of silicon used in manufacturing cells, thus saving money.

Intellectual Property Status:

Patent Pending

Potential Applications

- Silicon solar cells
- Photo-detectors

Benefits and Advantages

- **Lower Costs** – Simple process that is easy to use in a manufacturing settings
- **More Power** – Better light-trapping improves cell efficiency
- **Retrofit** – Can be implemented in existing manufacturing processes

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