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Solar Cells made using Radio Isotope Powered Electron Lithography

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Technology description

This invention relates to the use of radioisotope based lithography to pattern nanoscale features over potentially very large silicon substrate or arrays of silicon wafers simultaneously.
These wafers can be microfabricated to result in nanowire array that can serve as templates for super-hydrophobic substrates, solar-cell arrays, and disk storage media, field emission tips for displays, neural probes, etc. that benefit greatly due to high aspect ratio structures. Formation of solar cells by etching silicon in a substantially vertical etching process can also produce these nanowire arrays. Followed by an optional oxidation step to eliminate surface defects, and a metallization layer, one achieves a truly 3D nanowire array where each nano-wire is a PN diode. Efficiency as high as fifteen percent has been achieved. The nanowire array spacing is such that the array forms an optical sink for greatly reducing any reflected light from the surface. The surfaces look black indicating that most of the light is entering the solar array and not leaving. Light entering from almost any angle cannot leave making solar collection efficiency much higher over a day when the sun position changes across the sky. Filling the nanowire array with a dielectric (liquid or solid), followed by a counter electrode, such that a parallel energy storage medium is formed with a high surface area enabled by the nanowire array allows a solar light converter integrated with a energy storage mechanism to be implemented. This technology promises to greatly improve and expand the implementation of solar cells.

Application area

Solar cells

Advantages

Low cost method of improving performance

Institution

Cornell University

Inventors

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