Investigation of Spectral Response and Efficiency of Boron and Nitrogen-doped Diamond-like Carbon as the Top Junction in Multijunction Silicon Solar Cells

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Purpose: The world's energy consumption is increasing day by day. This increasing energy need is largely obtained from coal and petroleum by-products. Greenhouse gases and aerosols are emitted into the atmosphere by burning these fuels. The emission of these gases can be reduced by using renewable energy sources. This research project uses an amorphous carbon structure called Diamond-like carbon, which contains the bonds of ordinary pencil lead (graphite) and diamond. Thanks to "Quantum Mechanical Tunneling", this material does not take the conductive properties of graphite or the insulating properties of diamonds, and instead behaves like a semiconductor. This makes DLC a suitable material for solar panels. Procedure: The non-thermal plasma of the gases was produced at atmospheric pressure by using 15kV 30 kHz AC electricity with a mixture of acetylene, hydrogen and argon gases under an inert atmosphere. The produced plasma was evenly distributed over the silicon solar panel with the help of a CNC. Panels are tested and characterized. Conclusions: This study showed that DLC is a suitable solar cell semiconductor. Usage of DLC in multijunction solar cells is possible and economic to do. By repeatedly introducing the by-products generated during the coating process, the need for reactive gases can be reduced.

Awards Won:

SPIE, the international society for optics and photonics: First Award of $2,500