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[54] **HIGH-EFFICIENCY SOLAR CELL AND METHOD FOR FABRICATION**

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[52] U.S. Cl. **136/255; 136/262**

[58] Field of Search **136/255, 262**

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[57] **ABSTRACT**

A high-efficiency 3- or 4-junction solar cell is disclosed with a theoretical AM0 energy conversion efficiency of about 40%. The solar cell includes p-n junctions formed from indium gallium arsenide nitride (InGaAsN), gallium arsenide (GaAs) and indium gallium aluminum phosphide (InGaAlP) separated by n-p tunnel junctions. An optional germanium (Ge) p-n junction can be formed in the substrate upon which the other p-n junctions are grown. The bandgap energies for each p-n junction are tailored to provide substantially equal short-circuit currents for each p-n junction, thereby eliminating current bottlenecks and improving the overall energy conversion efficiency of the solar cell. Additionally, the use of an InGaAsN p-n junction overcomes super-bandgap energy losses that are present in conventional multi-junction solar cells. A method is also disclosed for fabricating the high-efficiency 3- or 4-junction solar cell by metal-organic chemical vapor deposition (MOCVD).

61 Claims, 4 Drawing Sheets

