Numerical Modeling of P-i-N Solar Cell

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Abstract

Solar energy is the cleanest form of renewable energy. The most popular form of utilization of solar energy is through the use of photovoltaic cells. Currently the efficiency of available solar cells lies below 20%. To increase the efficiency, multi-junction can be used in solar cells. While developing such devices we need platform to study various characteristics and parameters to optimize device performance.
In our project study, stress has been given on mathematical modeling of P-i-N solar cells. COMSOL Multiphysics® software is a new platform for modeling semiconductor devices. We have used partial differential equations for modeling the P-i-N photovoltaic system. This model can be used further for studying properties of advanced devices like multi-junction solar cells.

Figures used in the abstract

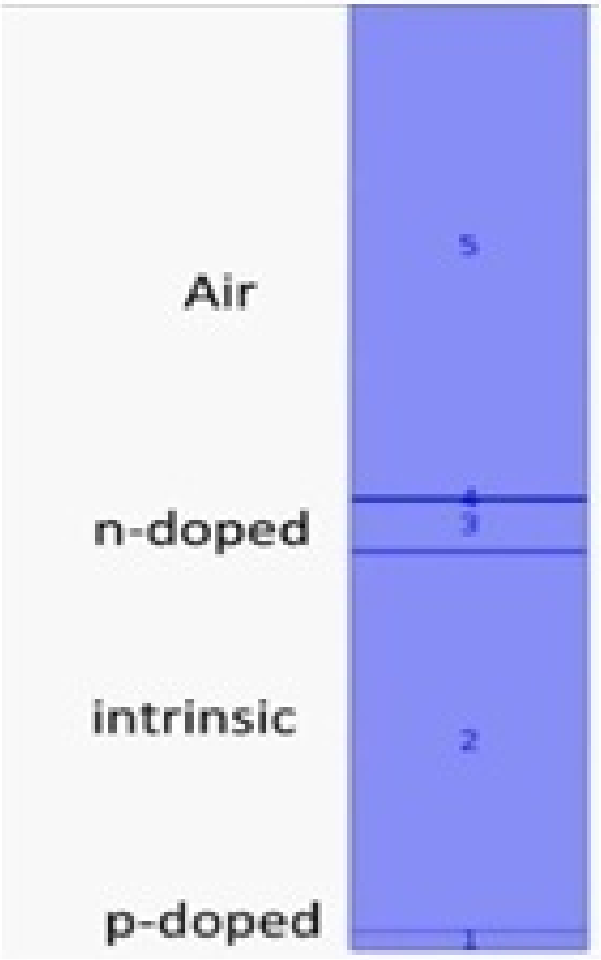

Figure 1: Model diagram of our simulated P-i-N solar cell.

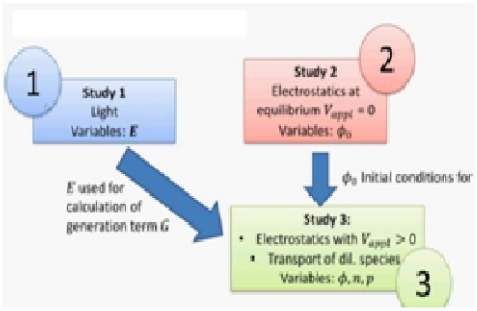

Figure 2: Block diagram of the steps involved in the study.

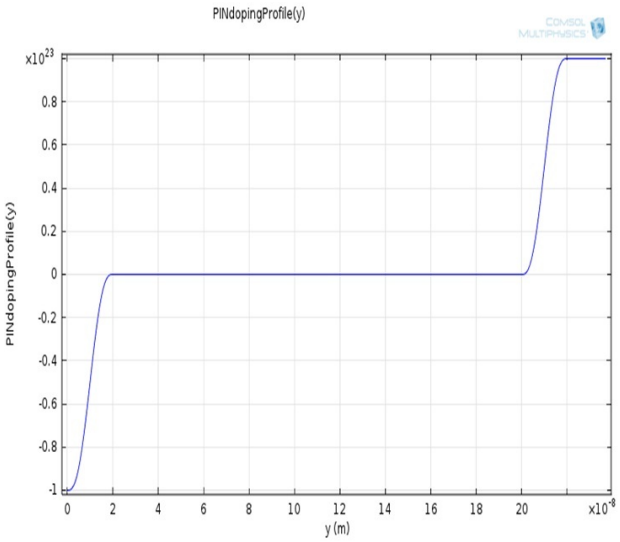

Figure 3: p-i-n doping profile.

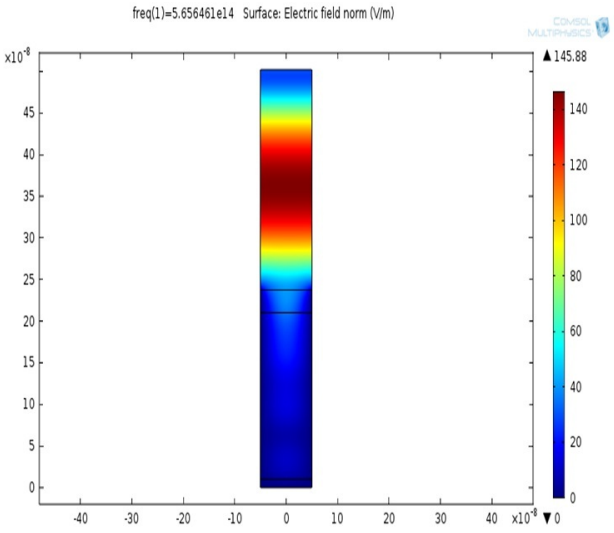

Figure 4: Variation of electric field inside device.