1. ABSTRACT

In recent years, because of global warming and the rise in crude oil price, countries worldwide have begun to invest heavily in research and development related to renewable energy sources. Among renewable energy generation systems, solar power generation has received the most attention; from small-scale applications (e.g., energy provision to consumer electronics) to large-scale operations (e.g., solar power plants), the scope of solar power applications is broad.

The characteristic curves of a solar cell are nonlinear and depend on the irradiance level and ambient temperature, resulting in a unique current–voltage (I–V) curve.

The purpose of this research is to minimize overall the cost of solar photovoltaic power plant by maximizing the efficiency of SPV system. The goal of this research is to Design a Solar cell to reduce the real power loss and optimization of performance and economy, which will be able to produce more electricity that can fulfill the energy demand of a house or small-scale industries to improve the efficiency with economy.

To design physical structure of the various thin film solar cells based on ZnO, III-V materials e.g. GaAs, GaN, InGaN etc., solar cells based on other emerging materials and multi junction solar cells using technology computer aided design (TCAD) tools from Silvaco International. To simulate electrical and optical characteristics the of these devices and extract the figures of merits like efficiency, open circuit voltage, short circuit current and fill factor. To study the effect of variation of doping concentration dimensions of the device and thickness of active layer on the figures of merits.