**A Planar PV Power System with Monolithically Embedded Power Converter**

Power converters constructed from discrete components are difficult to mass produce, and the installation involves a significant labor cost to have the proper interconnection among the panel, inverter and the grid. Several critical applications such as portable power station in a battlefield or scientific expedition will require several key attributes from a PV based power system such as modularity, high reliability and quick setup time. Therefore, a paradigm shift in the design of the entire PV power system is needed to mitigate this need. In order to increase the converter reliability and portability, the active and passive elements of a power converter (especially capacitors and active switches such as MOSFETs, JFETs or IGBTs) could be embedded on the same substrate material used for fabricating the p-n junctions in the photovoltaic panel. To the knowledge of the author, there is no prior work in cell-level power conversion with embedded converter, and therefore, this project idea could be considered as an "Outside the box" kind. A novel fabrication process along with experimental results have been proposed in this project demonstrating the integration of PV cells and major components needed to build a power converter on the same substrate/wafer. Because of the cell level power conversion, PV panels constructed from these cells are likely to be immune to partial shading and hot-spot effects. In addition, the effect of light exposure on converter switches has been analyzed to understand the converter behavior at various illumination levels. Simulation and experimental results have been summarized in a conference paper presented at IEEE APEC 2012 in support of this analysis. In addition to the process-related challenges and issues, this project reveals the justification of this integration by achieving higher reliability, portability and complete modular construction for PV-based energy harvesting units.