Lanthanum doped PZT ferroelectric films for photovoltaic applications

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Photovoltaic (PV) offers the ability to generate electricity in clean, quiet and reliable way. Photovoltaic systems are comprised of cells more commonly known as solar cells, devices that convert sun light directly into electricity. The current market in photovoltaic is dominated by Si solar cells. In these semiconductor based solar cells the open circuit voltage (V_{oc}) is limited by the band gap (E_g) of the material which in turn limits the PV conversion efficiency of the cell. There is an ongoing quest for improving the efficiency of solar cells, reducing their fabrication cost and exploring new alternate materials with higher PV conversion efficiency. Very recently it was demonstrated that above band gap voltages can be achieved from photovoltaic devices based on ferroelectric materials [1]. This has generated interest of researcher community towards exploring ferroelectrics for photovoltaic applications.

Our research focuses on investigating $Pb_{0.95}La_{0.05}(Zr_{0.54}Ti_{0.46})O_3$ (PLZT) thin films. These films were prepared using Metal-Organic Decomposition technique (MOD). Thickness of the grown films varied from 70-350 nm and the annealing temperature from 550-700^{o}C. Details of the film growth process including temperature/annealing and thickness effects, and electrical and optical characterization will be presented. The photo induced effects on the ferroelectric, leakage and I-V properties of PLZT based solar cells will be presented.

References

1. S. Y. Yang, J. Seidel, S. J. Byrnes, P. Shafer, C. H. Yang, M. D. Rossell, P. Yu, Y. H. Chu, J. F. Scott, J. W. Ager, L. W. Martin, and R. Ramesh, Nature Nanotechnology **5,** 143-147(2010).