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**Photovoltaic Enhancement with Ferroelectric $HfO_2$ Embedded in the Structure of Solar Cells**[1] RAHMATOLLAH ESKANDARI, LESZEK MALKINSKI, Advanced Materials Research Institute and Department of Physics, University of New Orleans — Enhancing total efficiency of the solar cells is focused on the improving one or all of the three main stages of the photovoltaic effect: absorption of the light, generation of the carriers and finally separation of the carriers. Ferroelectric photovoltaic designs target the last stage with large electric forces from polarized ferroelectric films that can be larger than band gap of the material and the built-in electric fields in semiconductor bipolar junctions. In this project we have fabricated very thin ferroelectric $HfO_2$ films (˜10nm) doped with silicon using RF sputtering method. Doped $HfO_2$ films were capped between two TiN layers (˜20nm) and annealed at temperatures of $800^oC$ and $1000^oC$ and Si content was varied between 6-10 mol. % using different size of mounted Si chip on hafnium target. Piezoforce microscopy (PFM) method proved clear ferroelectric properties in samples with 6 mol. % of Si that were annealed at $800^oC$. Ferroelectric samples were poled in opposite directions and embedded in the structure of a cell and an enhancement in photovoltaic properties were observed on the poled samples vs unpoled ones with KPFM and I-V measurements.

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Rahmatollah Eskandari
University of New Orleans

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