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Ferrophotovoltaic properties of PZN-4.5PT nanoparticles thin films

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Ferroelectric photovoltaics has been known for 50 years, it was not investigated extensively due to the low power conversion efficiency. Thus, we have very limited knowledge of ferroelectric materials and the underlying PV mechanism. Remarkably, recent research on the ferroelectric PV cells shows that engineered domain walls can exhibit a photovoltaic effect with an impressively high voltage output. The internal electric field in the ferroelectric material is one order of magnitude larger than conventional p-n or hetero junction solar cells [1]. Despite their excellent properties, one of the greatest difficulties to integrate widely such materials in electronic devices is to achieve them in thin films form because of their incongruent melting property [2]. In our recent studies we fabricate successively such thin films using the perovskites nanoparticles dispersed on a gel and deposited on silicon substrate conserving their ferroelectric properties.

In this work, we present a new generation of photovoltaic cells based on perovskite materials. Different parameters affect the performances of this cells such as architecture, the type of material used for the active layer, the techniques of fabrication and preparation of different layers. Thus we developed PZN-4.5PT and PZN-4.5PT + 1 % Mn nanoparticles thin film and show that these thin films could be used in photovoltaic and photoferroelectric applications. Different technics and methods were used to characterize them.

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