Ultra-thin solar cells of CdS/CdTe are one of the most promising innovations to be used as window generating electricity in sustainable and architectural buildings, and sun-roof for cars, among other applications [1]. On the other hand, the impact of transparent and conductive materials in daily life has increased in the last years, due to their applications on thin film transistors, transparent electronics, touch and flat panel displays, and specially solar cells. Usually they consist on wide gap degenerately doped oxides, and thus, they are known as Transparent Conductive Oxides (TCO) [2]. Fluorine-doped SnO$_2$ (FTO) is the most commonly TCO used in commercial CdTe-solar cells, as it can be deposited during glass manufacturing and it is in general inert to subsequent processing [3]. Usually, a double layer structure is used, which consist on a highly-doped primary layer and a nominally-undoped secondary layer. It has been shown that the secondary layer increases efficiency and/or reproducibility of the solar cells, and prevents diffusion of atoms from the underlying highly-doped substrate [4]. By MPS technique it is possible grow p-type CdTe as an ideal absorber material for high efficiency low-cost thin-film polycrystalline solar cells. Moreover the n-type CdS semiconductor continues being the best matching partner for these ultra-thin solar cells. These three materials, SnO$_2$, CdS and CdTe, can be sequentially deposited by the sputtering technique, to get a uniform deposition and scalability of thin films in the order of 35 nm, 50 nm and 600 nm, respectively. The main objective of this project is to develop ultra-thin solar cells of CdS/CdTe with a buffer layer of SnO$_2$ by the MPS technique with different contacts. Our processed heterostructures were characterized by XRD, UV-Vis and electrical measurements. We present the materials characterization results as well as PV-performance of our solar cells.

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