Abstract submission JNPV 2022: 2D Molybdenum disulfide (MoS_2) and thin molybdenum trioxide (MoO_3) as emitter layers in silicon based heterojunction solar cells.

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Silicon-based heterojunction solar cells Heterojunction solar cells are among the single junction solar cells that show the highest conversion efficiencies [1]. The principle of a heterojunction solar cell lies in a low surface recombination velocity through the separation of the crystalline silicon (c-Si) absorber from the highly recombination active metal contacts by a passivating, wide-bandgap emitter “buffer” layer. That buffer layer is usually made of a hydrogenated amorphous a-Si:H layer which displays a 1.7eV quasi-bandgap and an appropriate band offsets with c-Si, allowing to separate photo-generated carriers.

2D molybdenum disulphide and thin films of molybdenum trioxide, which can display high bandgaps of about 1.9eV and almost 2.9eV, respectively, are also promising semiconducting materials for such application, [3], [4]. We show, through SILVACO numerical device simulations, the potentialities lying in such solar cell devices made of either 2D-MoS_2/Si heterojunction or thin MoO_3/Si heterojunction. In this study, we are working on p-doped single-crystalline silicon absorber. We present preliminary results on the first heterostructures toward the development of such photovoltaic devices, from materials and heterostructures structural analyses to the first results on the heterojunction solar cells.

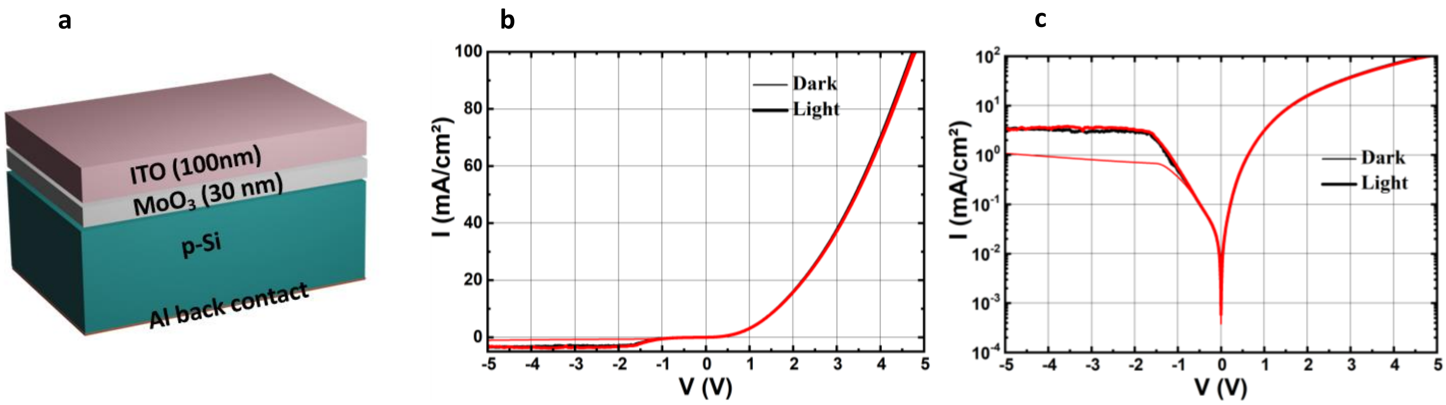

Figure 1. a) scheme of one studied heterostructure with MoO_3. No full metallic contact is deposited at the front. b) and c) Observation of diode and light effect on structure seen in a). A small pocket lamp has been used as light source.

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