SIMULATION STUDY OF A PEROVSKITE-BASED MODULE PERFORMANCE IN SUB-SAHARAN AFRICA REAL CONDITIONS.

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ABSTRACT:

According to it high power conversion and low-cost fabrication methods, perovskite solar cell gained more attracted interest. Several authors reported different efficiencies of perovskite solar cells [1-3]. But the confirmed efficiency measured under global AM1.5 spectrum at 25° C is 25.5%±0.8 [4]. The stability of this cell are not investigated by the authors. Jun Peng et al, raised an efficiency of 21.6%±0.6 [5] with a cells stabilized by 1000-h exposed to one sun light at 50° C.

The initial performance of 17.9%±0.5 is noted for a perovskite module [6]. Although the stability of this module has not been studied as well, Han et al, and Yang et al, [7-8] have reviewed the stability of a devices similar to a perovskite module with 16.1%±0.5 of efficiency [9]. Thus, with this exponential progress in the search for a structure that is as efficient as it is stable, perovskite is preparing to challenge silicon, which dominate the market.
The goal of this simulation work is to extract the electrical parameters of a perovskite-based module. Then, the performances of this module are simulated under the conditions of temperature, irradiation, wind and humidity in the sub-Saharan zone of Africa.

REFERENCES:

[1] Jung EH, Jeon NJ, Park EY, et al. Efficient, stable and scalable perovskite solar cells using poly(3-hexylthiophene). Nature. 2019; 567:511-515.
[2] https://www.anu.edu.au/news/all-news/anu-researchers-set-solar-record-with-next-gen-cells (accessed 18 September 2020)
[3] Higuchi H, Negami T. Largest highly efficient 203 × 203 mm2 CH 3 NH 3 PbI 3 perovskite solar modules. Jpn J Appl Phys. 2018; 57:08RE11.
[4] Han Y, Meyer S, Dkhissi Y, et al. Degradation observations of encapsulated planar CH 3 NH 3 PbI 3 perovskite solar cells at high temperatures and humidity. J Mater Chem A. 2015; 8139 - 8147.
[5] Yang Y, You J. Make perovskite solar cells stable. Nature. 2017;544(7649):155 - 156.
[6] Marquardt, D., «An Algorithm for Least-Squares Estimation of Nonlinear Parameters. » J. Soc. Ind. Appl. Math. 11 (2), pp. 431–441, 1963.