PVpanel Sim 2.0 – PV Module Simulation with Improved Device Physics

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Efficiency is a crucial parameter to consider when fabricating thin film (TF) photovoltaic panels because there is a significant efficiency drop between lab scale cells and large modules. PVpanel Sim is a circuit simulation using SPICE tool which combines the effects of the major reasons of efficiency reduction, like shunt leakages and sheet resistance, with external factors like irradiance and the effects of shadowing in order to provide the user with a better understanding of how a solar panel would behave. For the current version of the tool a basic equivalent model for individual cells is used with ideal components, this model is perfect for crystalline silicon (c-Si) solar cells but in order to efficiently simulate TF cells like amorphous silicon (a-Si) a different circuit model has to be incorporated. The model that is going to be used for a-Si cells includes two nonlinear voltage dependent current sources, representing photocurrent and recombination current; a diode, representing the dark current; for the shunt resistance a non-linear current source, depending on its own voltage and a conductance value, is used; and sheet resistance is included. The tool outputs include I-V and P-V plots as well as having the capability of giving 2D node voltage drop, 2D power generation, and shunt resistances plots that show how this values would change if shadowing is present or if photocurrent or shunt conductance differ. A more complete and realistic version of the tool is to be published taking into account the effects of the added changes.