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Comparisons of photovoltaic modules for their performances based on different substrates

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Abstract : Performance of photovoltaic (PV) module is investigated on different substrates, TPT, glass and aluminum. Theoretical simulations are made to calculate temperature field for those modules using a simple heat transfer model based on the finite element method (FEM). Theoretical results are obtained by keeping 3.2 mm of substrates thicknesses, and the average temperatures of PV modules are 62.78 °C, 64.38 °C and 68.71 °C for TPT, glass and aluminum substrates, respectively. Furthermore, the temperature distribution is studied with the specific substrate thickness, and interestingly only the temperature with aluminum substrate is decreased by increasing the substrate thickness. In addition, experiments are designed for the three modules, which are encapsulated and measured under non-constant and constant temperature conditions. Both theoretical and experimental results along with the temperature have a good agreement with each other. Power decays of three PV modules are also estimated, and found that their electrical efficiencies are close to 11 %.

Keywords: Substrate materials, PV temperatures, PV performances

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