

Effective Cooling of Photovoltaic Solar Cells by Inserting Triangular Ribs: A Numerical Study

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Abstract : In photovoltaic (PV) cells, most of the absorbed solar radiation cannot be converted into electricity. A large amount of solar radiation is converted to heat, which should be dissipated by any cooling techniques. In the present study, the cooling is achieved by inserting triangular ribs in the duct. A comprehensive two-dimensional thermo-fluid model for the effective cooling of PV cells has been developed. It has been first carefully validated against experimental and numerical results available in the literature. A parametric analysis was then carried out about the influence of the number and size of the ribs, wind speed, solar irradiance and inlet fluid velocity on the average solar cell and outlet air temperatures as well as the thermal and electrical efficiencies of the module. Results indicated that the use of triangular ribbed channels is a very effective cooling technique, which significantly reduces the average temperature of the PV cell, especially when increasing the number of ribs.

Keywords : effective cooling, numerical modeling, photovoltaic cell, triangular ribs

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