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UMP Excels in The Research Area of “PV Module Cooling”

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A UMP research team led by Dr. Sudhakar Kumarasamy in collaboration with Russian and Indian researchers have been working on cooling solutions for photovoltaic modules over the past few years.

In one of their recent research projects, a holographic film is used to prevent PV modules from overheating. Holographic films are extremely thin, flexible plastic films that can be laminated to various surfaces. They can direct the generated energy toward the solar cells by diffracting usable frequencies from the sunlight. They function correctly with prismatic concentrators known as "prismacons," which are made of a transparent material with very small holographic lenses. The holographic film, by simply being laminated onto the panel surface, prevents the module from overheating by reflecting infrared rays from its metallised top layer. The researchers also created a thermal model to evaluate the novel heat-protective film's performance. Its core is made up of a layer consisting of tiny beads.

Natural plants and coir pitch are proposed for cooling the PV modules in a previous study conducted by the team. When compared to an uncooled PV module, the placement of plants around the modules or coir pith underneath provide improved performance in terms of temperature reduction and power yield. Coir cooling produces the most significant increase in module power yield of 11.34 %, while plant cooling produces the second-best result with a 7.34 % increase in output power. The team further reviews the various PV cooling strategies including those of fluid-based natural cooling, forced convection air/ water cooling, liquid immersion cooling, nano-fluid based cooling, phase change materials-based cooling, heat pipes, heat sink or fins, micro-, microchannel heat exchangers, radiative sky cooling, thermoelectric cooling, evaporative cooling, and spectrum filter cooling. Findings from the research work is now published as a case study article in the reputed Elsevier's Journal, Case studies in Thermal Engineering (IF 4.724).

The work contributes critical insights and knowledge to the solar PV cooling research. PV Magazine, a well-known publication among the international photovoltaics (PV) community, is fully aware of the ongoing research efforts and development concerning the study of Solar PV cooling.