

## **Metal thin-film temperature sensor embedded in heat-sink for CPV cells characterization**

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### **1. Introduction**

The efficiency of a PV cell is strongly dependent on temperature, for this reason an accurate measurement of this parameter is important to fully characterize the device and to optimize its performance. The open circuit voltage ( $V_{oc}$ ) can be used as an indicator of the cell operating temperature [1], however, the  $V_{oc}$  vs.  $T$  correlation needs to be accurately calibrated with direct measurements.

For CPV applications a significant heat flux is needed to remove excess heat from the cell towards an heat-sink, making it difficult to derive the cell temperature.

In fact, measurements performed directly between the cell and the heat-sink, by use of commercial bulk sensors, would produce a significant disturbance in the heat flow; on the other hand, a measurement performed on the side of the cell/heat-sink interface would be subject to large uncertainties, due to the high radial temperature gradient.

### **2. Work description**

In the framework of the FAE "Fotovoltaico ad Alta Efficienza" research project (PO FESR Sicilia 2007/2013 4.1.1.1) [2], we approached the problem of accurate temperature monitoring of PV cell by fabricating a metal thin-film thermometer directly on the cell heat-sink. An electrical insulating layer between the heat-sink surface and the sensor is deposited using thin film technologies and its thickness is low enough to ensure minimal disturbance to the heat flow. The same fabrication process can be used to deposit the sensor on a metal foil, to obtain a reusable thermometer with an high thermal conductance. We present process details, results and future perspectives.

### **References**

- [1] G. Peharz et al. "A method for using CPV modules as temperature sensors and its application to rating procedures" *Solar Energy Materials & Solar Cells* 95 (2011) 2734–2744.
- [2] "FAE: a CPV-CHP system at concentration 2000 to produce electric power and heat", 2014, presented in this conference (CPV-10).