ΠΡΟΣ

1) **Όλα τα μέλη ΔΕΠ του Τμήματος Επιστήμης και Τεχνολογίας Υλικών**
2) **Την Επταμελή Εξεταστική Επιτροπή**
3) **Όλα τα μέλη της Πανεπιστημιακής Κοινότητας**

Πρόσκληση σε Δημόσια Παρουσίαση της Διδακτορικής Διατριβής του

κ. Γεώργιου Περράκη

με θέμα:

«Φωτονικές μέθοδοι για θερμικό έλεγχο και βελτίωση απόδοσης φωτοβολταϊκών διατάξεων»

«Photonic approaches for the thermal control of photovoltaics»

(Σύμφωνα με το άρθρο 41 του Ν. 4485/2017)

Πέμπτη 8 Απριλίου 2021 και ώρα **11:00**

https://zoom.us/j/92122780694?pwd=ZU9DL2M2K0lMM1JteEJ2WEZLYk9qQT09

Η παρουσίαση θα διεξαχθεί με τηλεδιάσκεψη στον παραπάνω σύνδεσμο, σύμφωνα με το άρθρο τρίτο, παρ. 1 της με αριθμ. 115744/Z1/4.9.2020 Κοινής Υπουργικής Απόφασης (Β΄3707).

Abstract

Photovoltaic modules (PVs) convert incident solar power to electrical power. However, the conversion efficiency is negatively affected by their operating temperature. Additionally, high operating temperatures accelerate the photovoltaics’ thermally activated power degradation. Conventional strategies for cooling are mainly focused on non-radiative heat transfer through forced airflow or heat-pipe-based cooling, which consume extra energy and significantly increase the system’s complexity. In this study, a precise opto-electro-thermal model was developed to examine the impact of radiative cooling in commercial PVs. Specifically, in our model we exploit the electromagnetic radiation of the sun as a source of energy and the space (outside the earth's atmosphere) as a "heat sink" with a much lower temperature (~ 3 K) than the atmosphere (~ 300 K). Optimal utilization of both "sources" can lead to an increase of the solar absorption and a reduction of the operating temperature. This temperature reduction can be achieved by the proper integration into photovoltaics of suitable photonic structures/coolers that (i) selectively reflect the unwanted sunlight (reducing this way the device heat load) and (ii) enhance the thermal

emission within the atmospheric transparency window at mid-infrared wavelengths (8-13 μm). Our results demonstrated that radiative cooling and other photonics-based heat reduction techniques can lower PV temperature and enhance the output electrical power when appropriate materials and photonic designs are effectively combined, even in the case of structures with reduced complexity. The main advantages of these techniques are the passive (no extra energy input needed) and environmental-friendly operation, as well as, the increased device lifetime.