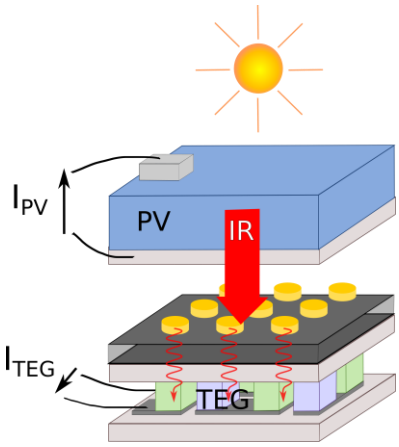
Internship offer – 2021

Modelling of thermoplasmonic antenna heat sources

Diploma: Bac + 5 (Master 2 Physics, Material Sciences)
Internship duration: 4 to 6 months.

Topic: Up to 50% of the solar energy striking a photovoltaic cell is lost or dissipated as heat. An original approach to recover this lost energy is to integrate the solar cell into a photovoltaic-thermoelectric (PV-TE) energy cogeneration system. In order to demonstrate a breakthrough in the efficiency of the PV-TE system, we propose a novel approach based on the use of thermoplasmonic nanoantennas between the solar cell and the thermoelectric generator. These nanoantennas convert infrared photons that are not absorbed by the solar cell into heat to increase the efficiency of the thermoelectric generator.

Purpose of the internship: The objective of the proposed internship is to model the propagation in the thermoelectric module of the heat created by these plasmonic sources thanks to a numerical resolution of the Fourier equation. We aim to study the dynamics of the heat propagation and to determine its spatial distribution in a stationary state. We will explore in particular the role of the size and shape of the antennas as well as their spacing and the type of metallic material used. The numerical modeling will be based on the implementation of the getDP opensource software. The results of this study will be used for the design of structures to be fabricated and characterized.



Schematics of a photovoltaic-thermoelectric cogeneration system integrating thermoplasmonic nanoantennas

Keywords: Modelling, Heat propagation, Thermoplasmonics, Energy cogeneration.

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