Ben-Gurion University of the Negev
Blaustein Institutes for Desert Research
The Swiss Institute for Dryland Environmental and Energy Research
Alexandre Yersin Department of Solar Energy and Environmental Physics

Surface arrays of subwavelength semiconducting structures for light trapping and broadband absorption of the solar radiation

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Abstract:

The seminar will provide an overview of new approaches, developed in our lab, for light trapping and broadband absorption of solar radiation. Light trapping and broadband absorption of the solar radiation is important for various photonic devices as well as for the harvesting of the solar radiation. For example, light trapping supports the realization of ultrathin PV cells with absorption comparable to bulk solar cells; this directly leads to lower recombination currents, higher open-circuit voltages and overall photovoltaic efficiency enhancement, as well as the utilization of scarce materials. We recently introduced a new paradigm for efficient light trapping that is based on arrays of subwavelength light funnels, which are unique geometries inverted with respect to the impinging illumination. We numerically demonstrated light trapping exceeding the Yablonovitch 4n2 limit as well as broadband absorption of the solar spectrum beyond the state-of-art. I will also review our recent work on nanopillar arrays decorated with self-aligned nanolens and broadband absorption based on deep subwavelength features. Finally, we will discuss new opportunities for efficient carrier extraction from such arrays.

Our research methodology involves numerical electromagnetic calculations, fabrication, near-field optical microscopy and far-field optical spectroscopy.

Date & Location:

Tuesday, December 8, 2020
Zoom meeting