The Energy & Sustainability Center
Bar-Ilan University

WEBINAR SERIES

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Tuesday, July 5
10:00 (Israel time)

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Possibilities & Limits for a Bright Solar (Cell) Future; a guide for the perplexed

Abstract

Devices for direct Solar to Electrical power conversion, including the solar absorbing materials, the cells, the modules and their accompanying mechanical and electronic support, continue to show amazing developments, esp. in the past ~15 years.
I will paint a rough picture of where we are at and where we can go, realistically. The latter involves the Shockley-Queisser, S-Q, model for light --> electrical energy conversion by the photovoltaic effect. What is often missed or misunderstood, is that it is a m o d e l ; as such assumptions are made. Thus, phrases like "*breaking the S-Q barrier*" should at least raise eyebrows, as the model is solidly rooted in thermodynamics. Any system that does not obey the assumptions, is outside the realm of the model, which, though, encompasses most types of solar cells and all commercial ones.
While most of the (academic) *research* today focuses on cells, primarily those based on organics or Halide Perovskites (HaPs), there are more challenges than these, even in terms of understanding what limits PV. The rough picture will include comparing between characteristics of the dominant Si cells and of other PV-relevant semiconductors.
Time-permitting, I will present a subjective view of what makes HaPs** so special in this field.

Thanks to PK Nayak (TIFR-H), T Kirchartz & U Rau (Juelich), JF Guillemoles (CNRS), G Hodes (WIS) and many others.

* cf. Nayak et al. *Nat. Rev. Mater.* 4 (2019) 269–285; Guillemoles, et al., *Nat Phot.* 13 (2019) 501-8
** https://wis-wander.weizmann.ac.il/chemistry/order-trumps-disorder

David Cahen studied chemistry and physics at the Hebrew University of Jerusalem (HUJI), materials research at Northwestern University, and biophysics (of photosynthesis) at HUJI and Weizmann Institute of Science (WIS). His research focus is on opto(bio)electronic materials chemistry and physics, and on what can make such materials sustainable, and on the how and why of proteins as electronic conductors. An AVS, MRS and Helmholtz Int'l fellow, and currently also visiting prof at Chiba University and CeNSE, IISc, and active in energy & sustainability education and science for peace, he also heads since 2017 a group at Bar Ilan University.