



## סמינר SEMINAR

### Light-matter interaction in photoelectrochemical cells for solar water splitting

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Hematite ( $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>) based photoelectrochemical cells convert sunlight into hydrogen fuel by splitting water molecules into hydrogen and oxygen. This enables long-term solar energy storage and provides a route for green hydrogen production as a zero-carbon fuel. Hematite is considered as a leading photoanode candidate, primarily due to its visible light absorption, stability and abundance. Despite half a century of research, the photoconversion efficiency of hematite photoanodes remains low, which is commonly attributed to fast charge carrier recombination. In an attempt to overcome this problem, advanced light trapping methods were employed to enhance sunlight absorption in ultrathin (~10 nm) hematite films in which the photogenerated electrons and holes can be extracted with minimal recombination. Although this effort was successful in enhancing sunlight absorption, the photocurrent remained low, suggesting that many of the absorbed photons excite localized electronic transitions rather than generate electrons and holes. To study the effect of these localized transitions, analytical methods were developed to extract the photogeneration yield spectrum, defined as the wavelength-dependent ratio between the absorption that ultimately contributes to the photocurrent and the overall absorption, from photocurrent action spectrum and optical measurements. This analysis indicates that the low photogeneration yield in this material severely limits its photoconversion efficiency, to the extent that more than half of the absorbed photons cannot contribute to the photocurrent.

**Supervisor: Prof. Avner Rothschild**

ההרצאה תתקיים ביום חמישי, ה 10 ביוני 2021 בשעה 14:30, בחדר 302, בניין מידן, לבעלי תו ירוק, או דרך זום.

**The Lecture will take place on Thursday, June 10<sup>th</sup> at 14:30, in room 302, Meidan, for green pass holders, or via ZOOM.**

**Topic: Seminars - Materials**

<https://technion.zoom.us/j/99592396977?pwd=azhKRUVrZkM2UDBENWIVVDExL2Q2UT09>

**Meeting ID: 995 9239 6977**

**Passcode: mt302m**