

תוכנית האנרגיה ע"ש גרנד

**תכנית האנרגיה ע"ש גרנד מתכבדת להזמין להרצאה סמינריונית
שתינתן ע"י:**

יוסי לוי

התכנית הבין-יחידתית לאנרגיה

בנושא:

The spatial distribution of the current collecting coefficient in photo-electro-chemical (PEC) cells

Iron oxide ($\alpha\text{-Fe}_2\text{O}_3$, hematite) is being researched as a photo-anode for PEC cells for water splitting by solar energy. There are many advantages for using hematite, the appropriate electrical properties, the stability, the abundance, the price etc. On the other hand, the severe disadvantage is the short diffusion length of the minority charge carriers, which decreases significantly the cell efficiency. To overcome this obstacle, we need to know the spatial distribution of the current collecting coefficient, i.e., the chance of a hole generated in a specific depth in the layer to contribute to the photocurrent rather than recombine with an electron. The hole must reach the surface and oxidize a hydroxide ion to oxygen (four holes per oxygen molecule) to contribute to the current. However, we cannot know where in the layer the hole was generated only by measuring the photocurrent. Therefore, we create different hole generation profiles by illuminating with different wavelengths or from both sides of the photo-anode, and measure the difference in the photocurrent. We can also create specimens with different optical layers and a similar hematite layer, assuming the coefficient is the same.

In order to calculate the generation profile for each wavelength we must know the layers' thicknesses and their optical index of refraction. Therefore we performed ellipsometry measurements and complemented them with cross sectional TEM. We performed wavelength dependent IPCE (EQE- external quantum efficiency) measurements in order to measure changes of photocurrent for different generation profiles. Analyzing those measurements gives us the spatial distribution of the current collecting coefficient.

We can repeat this for devices with different properties e.g. thickness, doping, morphology etc. in order to optimize the cell.

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במסגרת עבודת מחקר לתואר מגיסטר

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