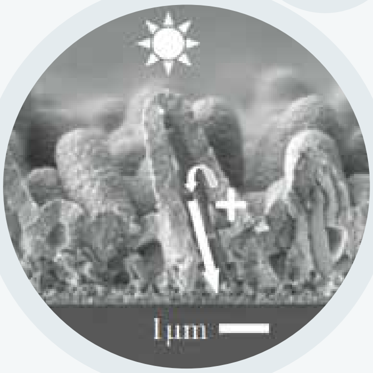

Photovoltaic Materials and Applications

Researcher

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Research

Dr. Visoly-Fisher's research focuses on developing low-cost photovoltaic devices via wet processing of organic and inorganic materials using novel deposition methods.

While the cost of commercial Si-based photovoltaic (PV) technology, converting sunlight to electricity, has dropped substantially in the past several years and reached grid-parity, the need to decrease costs is still of high priority to broadening its use off grid, as well as for niche applications such as building integrated photovoltaics and disposable energy sources.

Accordingly, our work mainly deals with the following topics:
- Novel device configurations, which can be deposited using low-cost methods such as wet processing at room temperature, thereby eliminating the need for high-vacuum clean rooms and high temperature processes.
- Long-term device stability of low cost devices, a necessary requirement for their commercialization.

Results and Products Highlights

- Semiconductor-sensitized PV cells were developed using chemical bath deposition and electrodeposition of semiconductors for devices operating in the IR range towards utilization as constituents in low cost tandem solar cells for wide spectrum utilization.
- Accelerated stability studies of organic and hybrid PV materials and devices, aimed at rapid screening of materials and device configurations. We use concentrated natural sunlight for high acceleration factors, and have shown that independent control of the temperature, sunlight intensity and ambient can contribute to understanding degradation mechanisms. These methods were applied to studies of the recently developed perovskite PV materials.
- Metal-free molecular junctions on ITO were developed, allowing the study of light-induced effects on transport in self-assembled porphyrin molecular junctions. We have shown photo-induced charge transfer between porphyrins and ITO surface states in the visible range, relevant to solar cells and OLEDs, and showed photovoltaic currents in monolayer-based junctions, towards extreme miniaturization of organic PV devices.