



* or Specialisation

** Physics or AFM

Bachelor*- or Master** Thesis Projects

Simulation of perovskite solar cells: Influence of ions

Motivation

Solar cells represent a very important contribution to the energy mix of the future. They are inexpensive and can be manufactured by means of efficient production using printing machines, and are operated CO₂-neutral.

In the tendered work, solar cells made of organic-inorganic perovskites will be simulated with the program [gpvdm](#) by Prof. Roderick MacKenzie to better understand the influence of ions on solar cell properties.

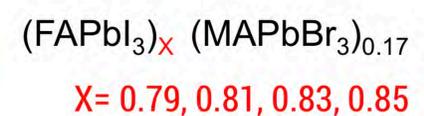
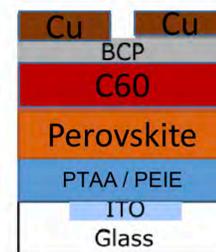
Tasks

The offered bachelor and master thesis deals with the simulation of perovskite solar cells - which reach power efficiencies of 25%. A challenge for the in-depth understanding is that these organic-inorganic perovskite semiconductors have a mixed electrical conduction of electrons and ions.

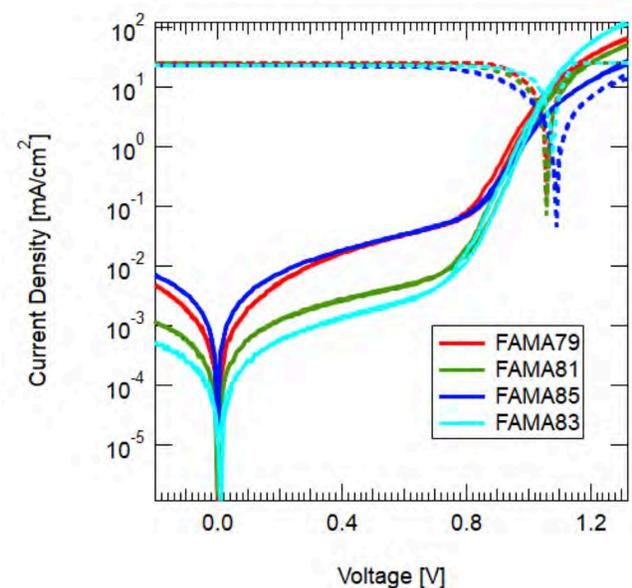
The current-voltage characteristics of perovskite solar cells often show hysteresis because the ions are slowly redistributed by the applied electric field. By impedance spectroscopy we can determine the velocity and concentration of different ion types. Our goal is to combine the measured ion properties and the measured hysteresis to directly prove the causality.

Supervision

This interesting work is jointly supervised by Prof. Deibel and Prof. MacKenzie. If you are interested, you can also produce your own solar cells and conduct experiments. **Under the current conditions it is in principle possible to carry out the work from the home office;** a close connection with various means of communication (email, video conference, etc.) is offered and its use is expected.



Concentration [g/l]	J _{sc} [mA/cm ²]	V _{oc} [V]	FF [%]	PCE [%]
0.79	25	1.06	80.4	21.3
0.81	24.4	1.06	70.3	18.2
0.83	22.7	1.09	76.3	18.7
0.85	22.6	1.09	61.3	15.0



Prerequisites

You should be interested in theoretical work on the physics of solar cells, have a good knowledge of semiconductor physics, and be willing to work intensively with a powerful simulation program as a tool. The detailed study of technical literature is part of the work as well as the discussion of the results within our group in English.

Contact

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