

## Master thesis suggestion

Relevant for: Physics/Chemistry/Materials science/Nanotechnology

### Synthesis and/or device modeling of organic silicon hybrid solar cells

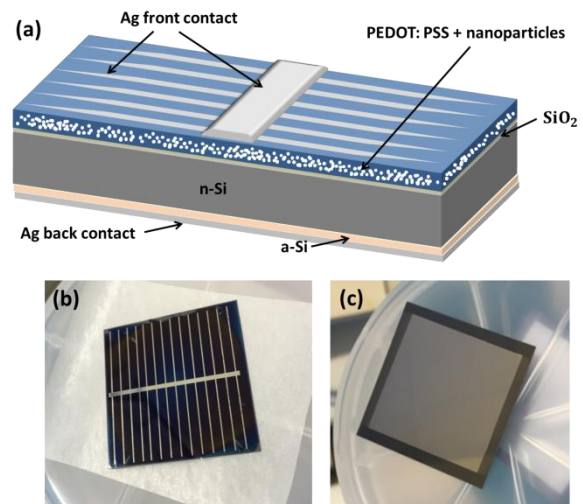
Organic-Si hybrid solar cells are one of the emerging photovoltaic (PV) technologies. Promising efficiencies exceeding 20% have already been reported recently and that high efficiency has been achieved within just last few years. The cells are composed of an n-type Si wafer and an organic polymer called poly(3,4-ethylenedioxythiophene): poly(styrenesulfonate) (PEDOT:PSS) used as the emitter and possessing p-type electrical conductivity. This type of solar cell provides a unique possibility to combine the high energy conversion efficiency of crystalline Si solar cells with the potentially low fabrication cost of organic solar cells. The idea of this Master thesis is theoretical and/or experimental study of organic/Si hybrid cells.

The experimental part of the project will consist of deposition of commercially available PEDOT:PSS on n-Si wafers by spin coating and characterization of optical and electrical properties of the structure. Si surface passivation will be studied by functionalizing PEDOT:PSS by different types of inorganic nanoparticles. Finally, Si/organic heterojunction solar cells will be fabricated and characterized.

The theoretical part consists of device modeling of two different types of solar cell designs, with the polymer emitter layer placed in the front side or back side of the cells. Optimal solar cell parameters and ultimate device performance will be estimated. The software to be used is Silvaco Atlas, for which IFE has the necessary competence and software license.

The work will be performed in the Department for Solar Energy at Institute for Energy Technology (IFE). Well-developed infrastructure and experience supervisors and lab engineers will be available for both the experimental and theoretical work. No prior knowledge of using the Silvaco Atlas or the experimental techniques is necessary.

IFE is located at Kjeller, ~20 km east of the center of Oslo. The solar energy group usually trains multiple master students from the universities at any given time, and the laboratory is relatively new with new, state-of-the-art equipment and offices. Welcome to IFE!



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