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Biography

Peter C. K. Vesborg received his PhD degree in Applied Physics from the DTU in 2010. He then went to the department of Chemical Engineering at Stanford University as a postdoc under Prof. Thomas Jaramillo before returning to Technical University of Denmark to join the faculty of the department of Physics in 2012, where he has been an associate professor since 2015. His research concerns catalysis (thermal, electro-, and photocatalysis), photoelectrodes, MEMS-based device development for catalyst benchmarking, and global resource availability and management for sustainable technologies.

Protected, Back-Illuminated Silicon As Photocathodes or Photoanodes for Water Splitting Tandem Stacks

Silicon is a promising contender in the race for low-bandgap absorbers for use in a solar driven monolithic water splitting cell (PEC). However, given its role as the low-bandgap material the silicon must be situated behind the corresponding high-bandgap material and as such, it will be exposed to (red) light from the dry back-side – not from the wet front side, where the electrochemistry takes place.[1,2] Depending on the configuration of the selective contacts (junctions) this may lead to compromises between high absorption and low recombination.[2,3] We discuss the tradeoffs and compare modeling results to measurements. Regardless of configuration, the wet surface of the silicon is prone to passivation or corrosion and must therefore be carefully protected in service in order to remain active. TiO_2 has been found as an effective protection layer for both photoanodes and photocathodes in acid electrolyte [4] and $NiCoO_x$ for photoanodes in alkaline electrolyte. [3] This is discussed in the context of general considerations for photoelectrode protection and state-of-the-art performance. [5]

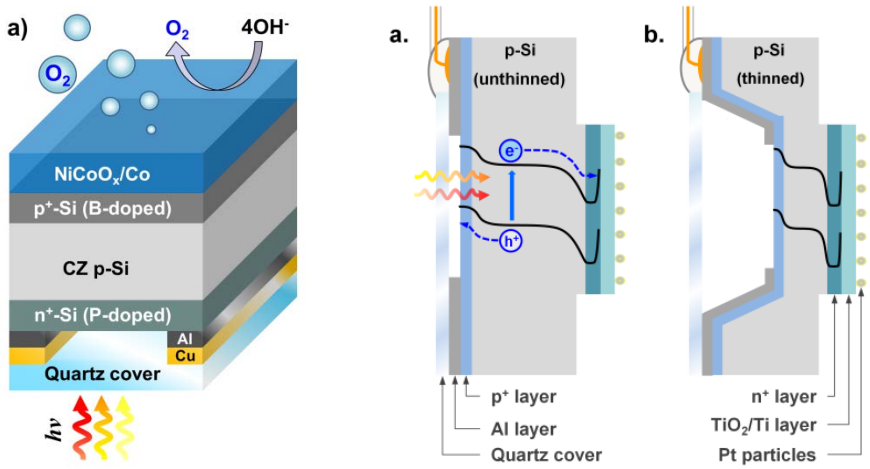

Figure. Back illuminated photoanode (left) and photocathode (right) (adapted from references [2] and [3])

References:

[1]: B. Seger *et al.*, Energ. Environ. Sci., 7 (8), 2397-2413 (2014), DOI:10.1039/c4ee01335b

[2]: D. Bae *et al.*, Energ. Environ. Sci., 8 (2), 650-660 (2015), DOI: 10.1039/c4ee03723e

[3]: D. Bae *et al.*, *ChemElectroChem*, 3 (10), 1546-1552 (2016), DOI: 10.1002/celc.201500554

[4]: B. Mei *et al.*, J. Phys. Chem. C., 119 (27), 15019-15027 (2015), DOI: 10.1021/acs.jpcc.5b04407

[5]: D. Bae *et al.*, Chem. Soc. Rev. (2017), DOI:10.1039/C6CS00918B