Catalysts, Protection Layers, and Semiconductors - DTU Orbit (08/11/2017)

Catalysts, Protection Layers, and Semiconductors: The Challenge of Interfacing

Hydrogen is the simplest solar fuel to produce and in this presentation we shall give a short overview of the pros and cons of various tandem devices [1]. The large band gap semiconductor needs to be in front, but apart from that we can chose to have either the anode in front or back using either acid or alkaline conditions. Since most relevant semiconductors are very prone to corrosion the advantage of using buried junctions and using protection layers offering shall be discussed [2-4]. Next we shall discuss the availability of various catalysts for being coupled to these protections layers and how their stability may be evaluated [5, 6]. Examples of half-cell reaction using protection layers for both cathode and anode will be discussed though some of recent examples under both alkaline and acidic conditions. Si is a very good low band gap semiconductor and by using TiO2 as a protection layer we can stabilize it for both H2 and O2 evolution [7, 8, 9, 10]. Notably NiOx promoted by iron is a material that is transparent, providing protection, and is a good catalyst for O2 evolution. We have also recently started searching for large band gap semicondutors like III-V based or pervoskite materials and follow the same strategy by using protection layers and catalysts [11].

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