**Patterned method of coating on flow field plates of PEM based Electrolyser for Hydrogen production**

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**ABSTRACT**

Hydrogen energy is one of the frontier alternatives to fossil fuels in energy applications. It can be produced either by hydrocarbon reformation or water electrolysis process. For on-site hydrogen generation, electrolysis is the best option and has the potential to produce hydrogen using renewable energy sources. Proton Exchange Membrane (PEM) Electrolyzers can be operated at higher current densities and under high pressurized conditions with high voltage efficiency compared to alkaline electrolyzers. In PEM electrolyzer, bipolar plate or flow field plate is one of the important components, which simultaneously ensures charge carrier transport from cell to adjacent cell, supply and removal of reactants (i.e water), removal of produced gases (i.e H2 and O2) and provides mechanical stability to electrolyzer. Titanium is conventionally used flowfield plates because of good corrosion resistance and high mechanical strength, but it is prone to oxidation on the anode side and hydrogen embrittlement on the cathode side. Hence a coating of Platinum over the titanium is widely used as a protective and conductive purpose. However, it increases the system cost further.

In the present work, an attempt has been made to reduce the platinum content on Ti-6Al-4V substrate. This was achieved through a patterned platinum coating using electrodeposition technique followed by formation of TiOx layer by thermal oxidation or electrochemical anodization. This has reduced the coverage of Pt to 30-40% on the substrate. The patterned substrate was characterized for uniformity of Pt coating using FESEM and Optical profilometry. The corrosion resistance and stability of the coating are studied in a simulated PEM water electolyser environment using potentiodynamic and potentiostatic test. The Ecorr and Icorr of Patterned coating were found to be 554mV and 2.1µA/cm2. The results show that patterned coating on flowfield plates can reduce the cost without compromising in corrosion protection. These results will be discussed.

*Keywords: PEM Electrolyzer, Flowfeld Plates, Ti-6Al-4V, Platinum.*