

Contact problems at the interface of Iridium oxide catalysts and titanium porous transport layer in anode of PEMWE

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To date, studies regarding low Ir loaded catalyst layer (CL) anode in polymer electrolyte membrane water electrolysis (PEMWE) are yet insufficient and didn't present appropriate solutions to enhance its performance. The biggest problem in the low Ir loaded CLs is unexplained performance drop, which is attributed to increased Ohmic resistance and reduced catalyst surface area. Previous studies insisted that it is responsible for isolation of catalysts not neighboring the porous transport layers (PTLs). In that vein, recent studies are focusing on improving in-plane electron conduction in CL by introducing 1D materials, conductive polymers or microporous layers.

Herein, we want to present another critical variable for the low loaded CLs, which is the native oxide layers on the Ti PTL. The titanium oxide layer makes a huge contact resistance and induces irreversible performance degradation. Such abnormal phenomena only appear at low Ir or high ionomer loaded CLs, whereas it vanishes when the oxide layer is eliminated or iridium oxide catalysts become rutile. In this research, we define and elucidate above phenomena and present a direction that PEMWE should pursue for.