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Industrial high volume low cost MaxPhase™ coatings on bipolar plates for fuel cells deposited by PVD in a high throughput coating system

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Fuel cell technology is an alternative and emerging route for energy storage. Low cost and high reliability is essential for making any energy storage attractive for the market. For the fuel cell functionality, the most critical parts are the membranes and the bipolar plates (BPP). The multifunctional role of the BPP in the fuel cell (FC) stack as a cell separator, gas distributor, and current collector set up high demands on their properties regarding weight, formability, corrosion resistance, electrical conductivity, and cost. Metal BPP has many advantages over graphite plates, such as small thickness, low forming cost, but has a poor contact resistance.
Thin, protective coatings (< 1µm) deposited by physical vapor deposition (PVD) offer a cost-effective corrosion protection of the metal BPPs from degradation during cell operation. In addition to maintain favorable functional properties (electrical and chemical) in the FC environment, the coating and BBP should also meet the U.S. Department of Energy (DOE) cost requirements of about 3 $/kW by 2020. The choice of coating process and material, together with the physical design of the BPP should therefore be considered already in an early stage in the fuel cell stack development.
Impact Coatings is currently offering MaxPhase™ as a low cost coating material suitable for stainless steel BPP, thus replacing the need for noble metal coating. Using the InlineCoater™ deposition system gives a high throughput, short cycle deposition of cost-effective MaxPhase™ coatings.
In the current study, we compare MaxPhase™ with gold coatings. The study encompasses coating chemical stability, electrical properties, both in situ and ex situ, as well as life-time investigations. Moreover, also production cost calculations were performed. The results shows that low cost MaxPhase™ coatings on BPP produced in the InlineCoater™ system exhibit properties similar to gold, and are thus promising candidates for meeting the production cost goals as recommended by DOE.

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