Photonic Manufacturing Processes for Components in Electrochemical Cells

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Although the largest amount of hydrogen produced today is obtained by steam reforming, a significant increase in hydrogen production is foreseeable through electrolysis using renewable energies. There are numerous research and development activities aimed at reducing production costs. The fundamental understanding of occurring power losses and aging processes in the cell components catalyst, membrane and porous transfer layer (PTL) is crucial to further improve this technology while reducing costs.

Porous transport media are the liquid/gas diffusion layers, which are critical components in water electrolyzers. In the cell structure, these components are located between the catalyst layer and the respective flow field. Very different requirements are placed on the diffusion layers – good electrical contacting and conductivity, high porosity for the necessary mass transport of water and gas, mechanical stability and corrosion resistance at high temperatures (80°C) and low pH values.

Various porous transport media made of titanium have already been used and investigated in water electrolyzers. These were felts, nets, foams and sintered particles made of titanium. We present novel photonic manufacturing processes for the treatment and production of titanium-based electrode materials used in electrochemical cells, for which we see great potential with respect to design flexibility, lower requirements for raw material quality and higher production speed.