Influence of micro-profiled surface of a polymeric composite bipolar plate on the fuel cell performance

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Abstract.
In standard dimension fuel cells, the flow of fuels and water is governed by volumetric effects, but surface structure could become critical when dimensions shrink. Performance of micro-scale fuel cells could be influenced by the surface quality of the gas flow channels; parameters that can be ignored on macro-scale need to be considered when modelling microfluidics devices. In this paper are presented the experiments and analyses of different technologies for micro-profiling the cavity surfaces of an injection mould for conductive polymeric composite bipolar micro-channel plate, the injection moulding experiments and the influence of the surface structure on the performance of the fuel cell stack. There are compared additive laser deposition versus laser ablation technologies for the manufacturing the bipolar plates cavities with a flow channels section of 0.2 x 0.2 mm² at an active gas flow area of 10 x 10 mm² and 0.4 x 0.4 mm² at an active gas flow area of 20 x 20 mm². The fuel cell assembly was tested by supplying hydrogen and oxygen from an PEM electrolyze device and polarization curves were recorded.