

ABSTRACT

A novel design of multi-sectional flow field for cathode side of small or micro DMFC is fabricated using MEMS and precision machining processes. The flow field includes a parallel-channel section, buffer zone and recycling channels. The preliminary tests of water wetting process in the flow field show that the flow field with hydrophilic surface can provide a favorable recycling ability. The *in-situ* observation of actual single DMFC shows the different behaviors of water respectively associated with stainless steel mesh and carbon cloth. Furthermore, the *in-situ* observation indicates the water transport behavior in the parallel channels. All the channels with observation opening are found to be free from water clogging even at a low air flow rate ($< 10\text{ ml/min}$). This novel flow field is experimentally demonstrated to handle the water generation and prevent water clogging in the channels. In the test of single DMFC, flow field with gold-plated surface and deeper channel depth can obtain maximum current and power output for about 4.6 and 5.6 times compared with SiO_2 flow field.

Keywords: DMFC, in-situ observation, flow field plate