Characteristics of metallic bipolar plate for automotive polymer electrolyte membrane fuel cells

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As the stainless steel has a good corrosion resistance and mechanical properties, it has been studied as the candidate material of metallic bipolar plate for automotive PEMFC. But, iron and nickel elements are dissolved under fuel cell operating conditions. These elements contaminate the MEA and deteriorate the fuel cell performance. Passive film of stainless steel also grows in the fuel cell environment, and increases the contact resistance on the separator. These problems have been acted as an obstacle in the application of stainless steel to bipolar plate. Therefore, many kinds of coating technologies have been examined in order to solve these problems. In this study, stainless steel was coated in order to have high conductivity and corrosion resistance. Contact resistance was measured by using a tensile tester and impedance analyzer. Corrosion property of coated stainless steel was examined by potentiodynamic polarization test in a solution simulating the anodic and cathodic environment of PEMFC. Gold coated stainless steel and graphite were also tested as comparative samples. Coated stainless steel showed better corrosion resistance, contact resistance and cell performance.