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Study on the Effect of Bolt Locking Method on the Deformation of Bipolar Plate in PEMFC

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Abstract : Assembly of the proton exchange membrane fuel cells (PEMFC) has a very important influence on its performance and efficiency. The various components of PEMFC stack are usually locked and fixed by bolts. Locking bolt will cause the deformation of the bipolar plate and the other components, which will affect directly the deformation degree of the integral parts of the PEMFC as well as the performance of PEMFC. This paper focuses on the object of three-cell stack of PEMFC. Finite element simulation is used to investigate the deformation of bipolar plate caused by quantity and layout of bolts, bolt locking pressure, and bolt locking sequence, etc. Finally, we made a conclusion that the optimal combination packaging scheme was adopted to assemble the fuel cell stack. The scheme was in use of 3.8 MPa locking pressure imposed on the fuel cell stack, type Ⅱ of four locking bolts and longitudinal locking method. The scheme was obtained by comparatively analyzing the overall displacement contour of PEMFC stack, absolute displacement curve of bipolar plate along the given three paths in the Z direction and the polarization curve of fuel cell. The research results are helpful for the fuel cell stack assembly.

Keywords : bipolar plate, deformation, finite element simulation, fuel cell, locking bolt
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