Indirect Selective Laser Sintering of Graphite Bi-polar Plates for Direct Methane Fuel Cells (DMFC)

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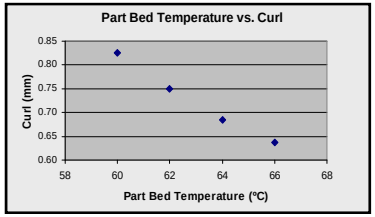
Abstract

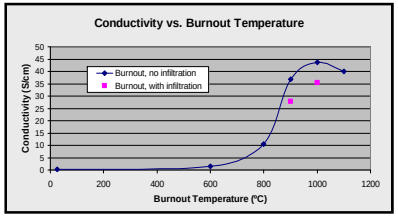
Selective Laser Sintering (SLS) is a manufacturing method which creates parts directly from three dimensional computer models. This effort involves a parametric study of the laser power level and the temperature set point for the indirect Selective Laser Sintering (SLS) manufacturing process of graphite bi-polar plates for Direct Methanol Fuel Cells (DMFC), a process previously developed at the University of Texas Austin (UT Austin). This effort also includes a parametric study of burnout temperature and laser power level with respect to final conductivity. Infiltration of the plates with cyanoacrylate was also explored.

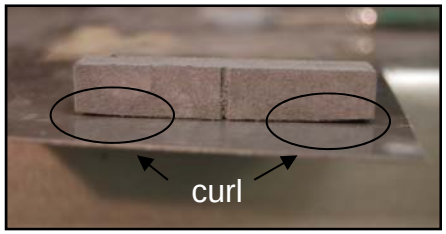
Results/Conclusions

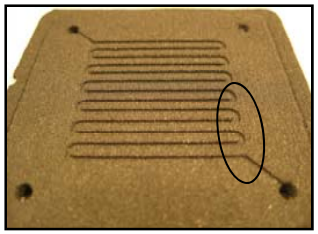
The indirect SLS process of graphite bi-polar plates was successfully repeated. Parameters were optimized to reduce curl and growth in the parts. The conductivity trend with respect to burnout temperature was validated.

Data and Analysis









Curl (b.l) was reduced (t.l) by increasing Part Bed Temperature. Conductivity increased with Burnout Temperature (t.r). Inclining the part in the build chamber improved channel definition (b.r).

Relevance

Graphite fuel cell plates are desirable due to high conductivity and low weight. The results of this research will contribute to the ongoing feasibility of replacing the conventional time-consuming and expensive process of manufacturing graphite bipolar fuel cell plates with parts fabricated using a SLS machine.