Improving thermal stability of cathode for low temperature thin film solid oxide fuel cells by vacuum thin film deposition methods

Suk Won Cha(swcha@snu.ac.kr)[1], Sangbong Ryu[1], Ikwhang Chang[2]
Yoon Ho Lee[3]
[1]Seoul National University, [2]Wonkwang University, [3]University of California, San Diego

Abstract
Due to its high catalytic activity and convenient fabrication procedure that uses physical vapor deposition (PVD), nanofabricated platinum (Pt) is widely used for low temperature operating solid oxide fuel cells (LT-SOFC). However, the poor thermal stability of nanofabricated Pt accelerates cell performance degradation. In an effort to avoid thermal agglomeration of metal electrodes, an ultrathin oxide material, gadolinia doped ceria(GDC) and yttria stabilized zirconia(YSZ), are coated on porous metal (Pt) cathode of each sample respectively by vacuum thin film deposition method, sputtering and atomic layer deposition(ALD). The thin thermal barrier coating is found to maintain the morphology of its underlying nanoporous Pt during high temperature operation, 500 °C. Both GDC and YSZ the thin film coating on Pt are found to improve oxygen reduction reaction activity and this improvement is attributed to an enhanced triple phase area, especially in the vicinity of the Pt-electrolyte interface. While the degradation of the performance of pure Pt fuel cell is reduced from 43 % to 7% in an hour with sputtered GDC barrier, the performance of ALD YSZ barrier applied fuel cell keeps enhancing during the 210min operation.

Keywords: *Low temperature solid oxide fuel cell, cathode thermal stability, vacuum thin film deposition*

Biography
Professor in the Department of Mechanical and Aerospace Engineering, Seoul National University.