Electronic Supplementary Information (ESI)

Integrated design of a Ni thin-film electrode on a porous alumina template for affordable and high-performance low-temperature solid oxide fuel cells

Sanghoon Ji[a,b,c]‡, Han Gil Seo[a]‡, Siwon Lee[a], Jongsu Seo[a], Yeageun Lee[d], Waqas Hassan Tanveer[d], Suk Won Cha[d], and WooChul Jung[a,*]

[a]*Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology, Daehak-ro, Yuseong-gu, Daejeon 34141, Republic of Korea. Fax: +82-42-350-3310; Tel: +82-42-350-3314. E-mail: wcjung@kaist.ac.kr*
[b]*Applied Science Research Center, Korea Advanced Institute of Science and Technology, Daehak-ro, Yuseong-gu, Daejeon 34141, Republic of Korea.*
[c]*Future Strategy & Convergence Research Institute, Korea Institute of Civil Engineering and Building Technology, Goyangdae-ro, Ilsanseo-gu, Goyang-si, Gyeonggi-do 10223, Republic of Korea.*
[d]*Department of Mechanical and Aerospace Engineering, Seoul National University, Gwanak-ro, Gwanak-gu, Seoul 08826, Republic of Korea.*
‡ These two authors made equal contributions.
**E-mail: wcjung@kaist.ac.kr*

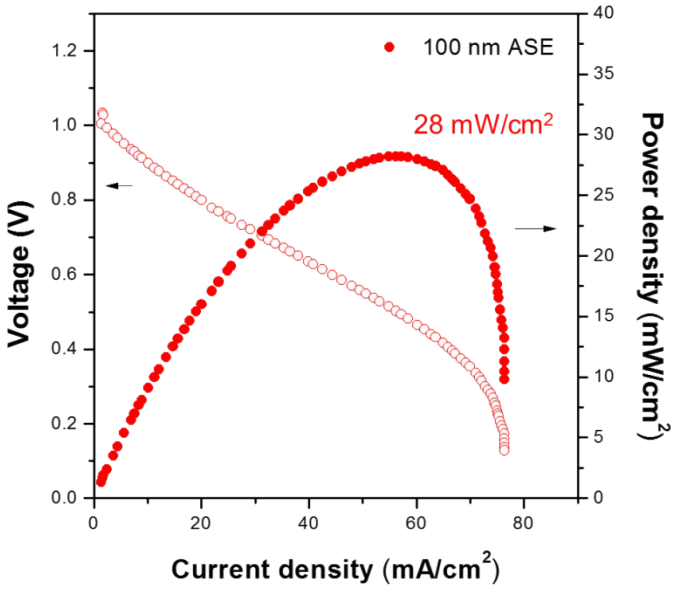

Fig. S1. Current-voltage (*I-V*) characteristics of a full cell with a 100 nm-thick Ni ASE measured at 500°C

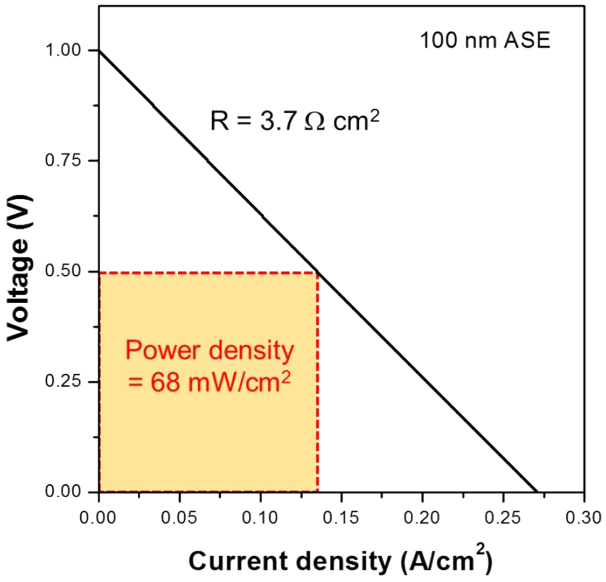

Fig. S2. Estimated power density of a full cell with a 100 nm-thick Ni ASE based on the ASR values of only the anode. Linear *I-V* characteristics are assumed.

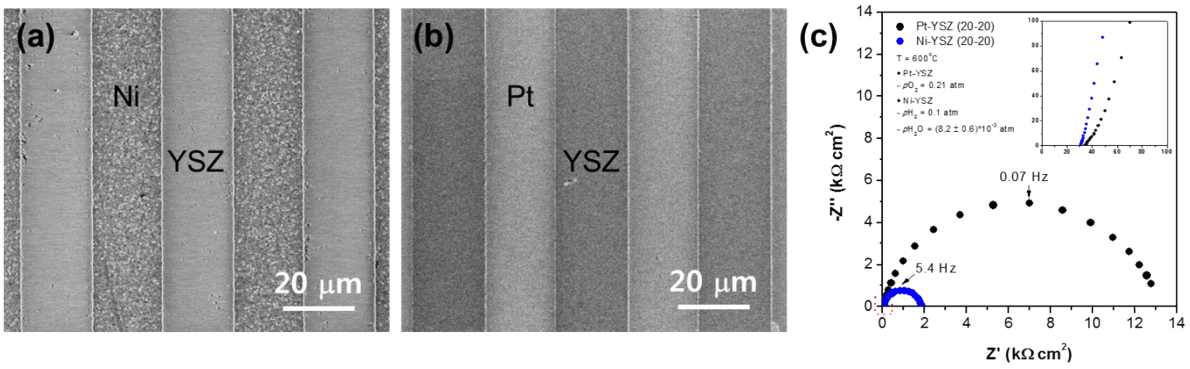

Fig. S3. Top-view SEM images of well-defined, 20 μm (a) Ni and (b) Pt patterns on a YSZ substrate. (c) The impedance spectra of both symmetric cells (Ni|YSZ|Ni and Pt|YSZ|Pt) measured at 600°C with anodic (pH_2 = 0.1 atm, pH_2O = (8.2 ± 0.6)*10^{-3} atm) and cathodic (pO_2 = 0.21 atm) conditions.

Table S1. The electrolyte-area normalized electrode resistances and capacitances of both symmetric cells (Ni|YSZ|Ni and Pt|YSZ|Pt) measured at 600°C with anodic (pH_2 = 0.1 atm, pH_2O = (8.2 ± 0.6)*10^{-3} atm) and cathodic (pO_2 = 0.21 atm) conditions.

600°C	Ni-YSZ	Pt-YSZ
ASR (Ωcm^2)	902	6537
Capacitance (Fcm^{-2})	4 x 10^{-5}	3 x 10^{-4}