

Supporting Information

A Dense La(Sr)Fe(Mn)O_{3-δ} Nano-film Anode for Intermediate-Temperature Solid Oxide Fuel Cells

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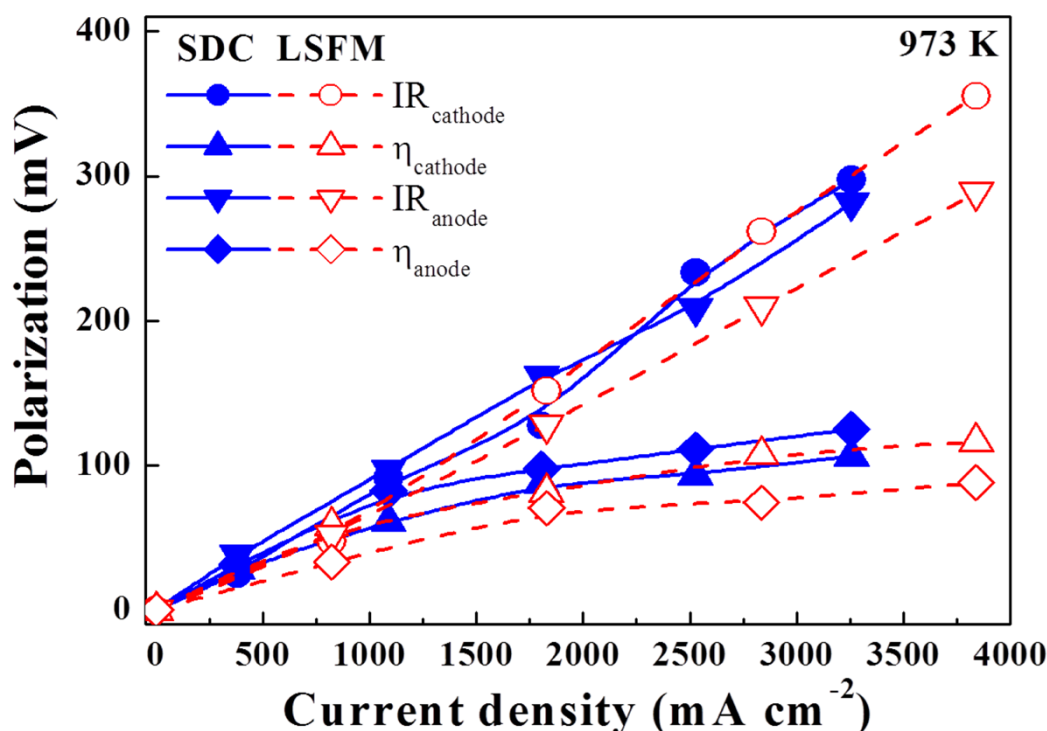


Fig. S1. Internal resistance at 973 K in the metal-supported cell with/without a La_{0.6}Sr_{0.4}Fe_{0.9}Mn_{0.1}O_{3-δ} film.

Fig. S1 shows a comparison of the internal resistances of the LSFM cell (SSC (Sm_{0.5}Sr_{0.5}CoO_{3-δ}) / LSGM (La_{0.9}Sr_{0.1}Ga_{0.2}Mg_{0.2}O_{3-δ}) / LSFM (La_{0.6}Sr_{0.4}Fe_{0.9}Mn_{0.1}O_{3-δ}) / Ni-Fe substrate) and the SDC cell (SSC (Sm_{0.5}Sr_{0.5}CoO_{3-δ}) / LSGM (La_{0.9}Sr_{0.1}Ga_{0.2}Mg_{0.2}O_{3-δ}) / SDC (Sm_{0.2}Ce_{0.8}O_{2-δ}) / Ni-Fe substrate) at 973 K. The internal resistances were measured by current interruption method. In both cases, the cathodic internal resistance remained almost unchanged. In contrast, the anodic internal resistance decreased significantly when the LSFM anode was used. These results indicate that the increase in power density was dominated by the anodic performance.

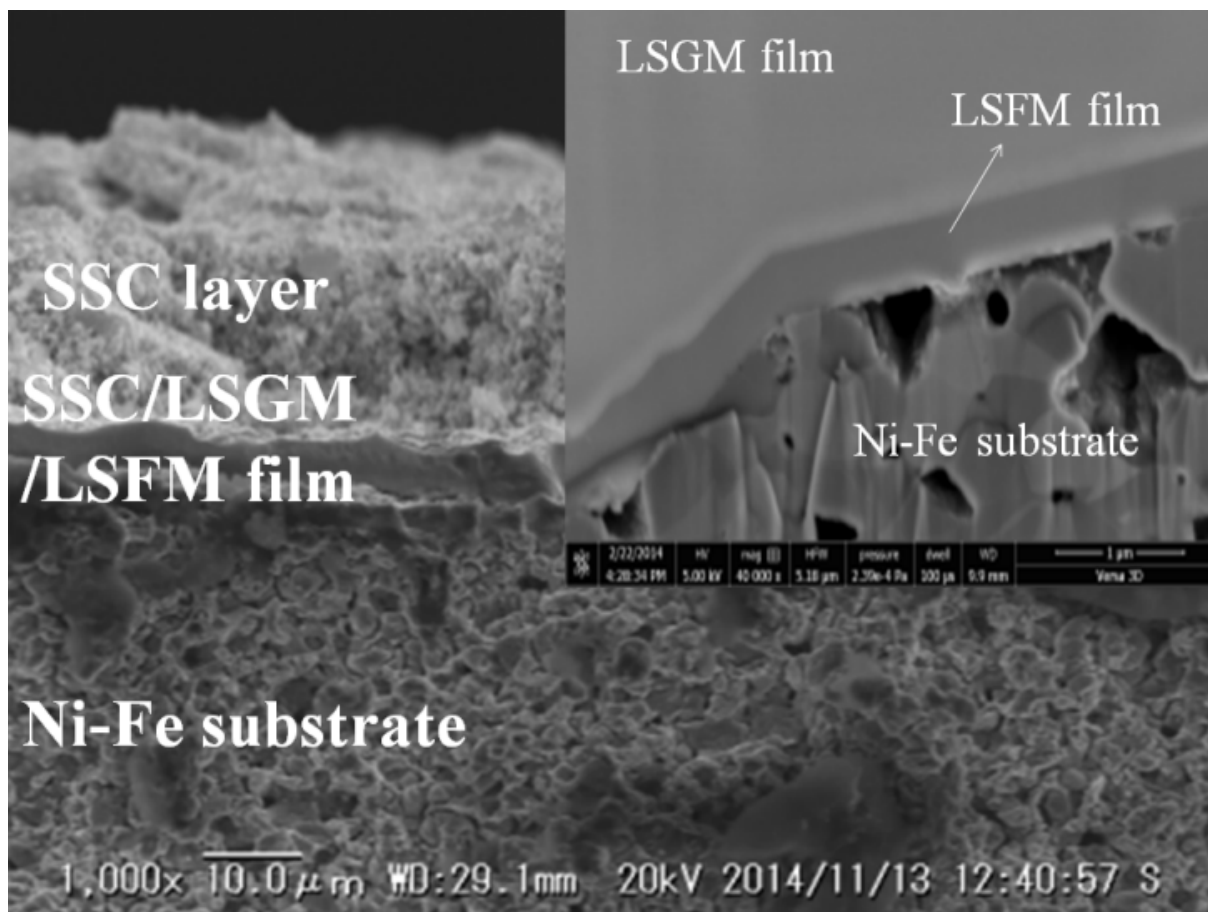


Fig. S2. Cross-section images of LSFM cell (SSC ($\text{Sm}_{0.5}\text{Sr}_{0.5}\text{CoO}_{3-\delta}$) powder/SSC film/LSGM ($\text{La}_{0.9}\text{Sr}_{0.1}\text{Ga}_{0.2}\text{Mg}_{0.2}\text{O}_{3-\delta}$) film/LSFM ($\text{La}_{0.6}\text{Sr}_{0.4}\text{Fe}_{0.9}\text{Mn}_{0.1}\text{O}_{3-\delta}$) film/Ni-Fe substrate) after cell operation at intermediated temperatures.

Fig. S2 shows a cross-section image of cell using LSFM thin film anode. Even after operating under various conditions, the LSFM film still displays dense morphology and are well-attached on Ni-Fe metal substrate.

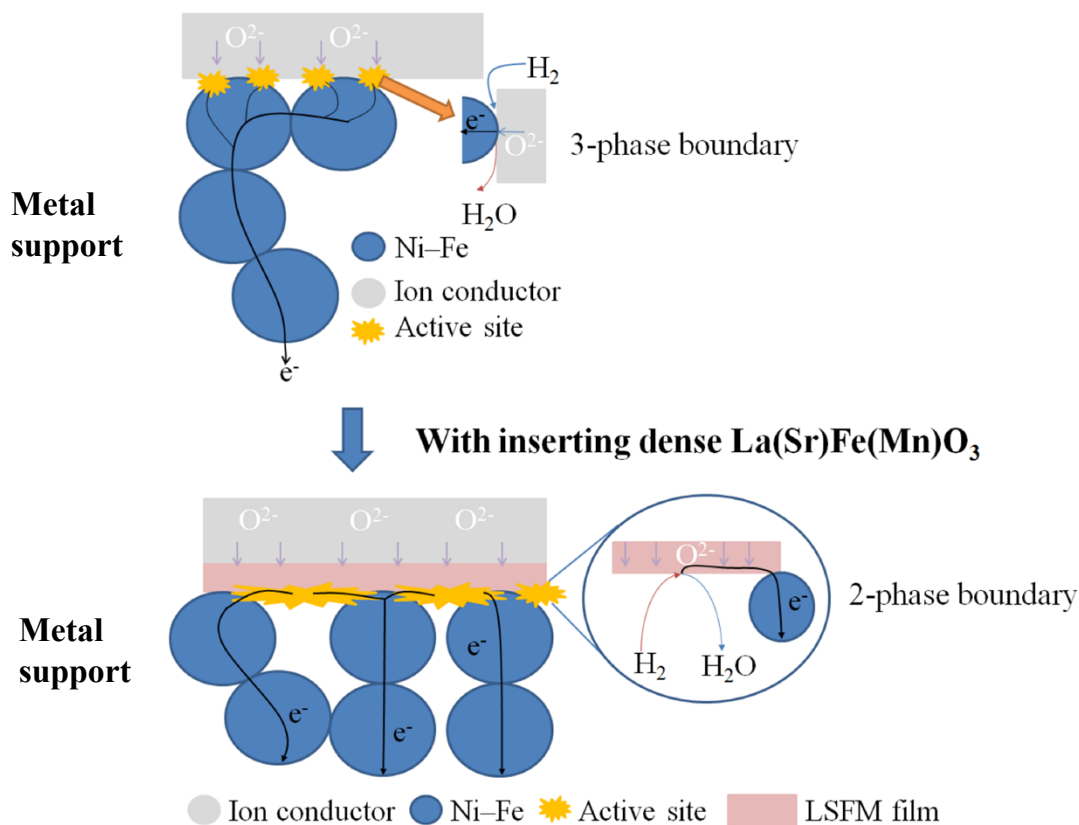


Fig. S3. Schematic image of active site of metal-supported cell SDC film and LSFM film.

Figure S3 Schematic image of active site of conventional metal support and LSFM anode.

In the case of ‘SDC cell’ (called as ‘Ni-Fe cell’ in previous), the interface between SDC film and Ni-Fe substrate plays the role of anode. On the other hand, in the case of ‘LSFM cell’, we expecting reaction site can be expand from three phase boundary to two phase boundary of LSFM film and so the LSFM film is expecting to be dense anode because of high mixed conductivity.