Ceria is a good electrocatalyst which is resistant to the carbon deposition and is sulfur-tolerant. The Ce component from nitrates was coated onto the as-prepared lanthanum doped strontium titanate (La₉ₒ₋₀.₀₂Sr₀.₀₂TiO₃, LST) particles using an ethanol-water mixed semi-organic solution to form the core-shell structure. The shell coverage of Ce compound increases with the amount of Ce-coating (Fig. 1). The lattice of LST did not change so much with the amount of Ce-coating after 1300-1400°C sintering in air. The lattice distortion occurred significantly when the core-shell material of Ce-LST was sintered as high as the temperature of 1500°C in air (Fig. 2). Therefore, the Ce component may diffuse into LST lattice to result in the lattice depression at high sintering temperature in air atmosphere. However, the Ce diffusion into LST lattice to affect the lattice distortion was also observed for the core-shell material of Ce-LST sintered at 1400°C in activated carbon reduction atmosphere (the black dashed line in Fig. 2).

The LST is a mixed ion and electron conductive (MIEC) material. The DC conductivity of sintered LST is higher than those of Ce-coated LST materials measured under the 95%Ar+5%H₂ atmosphere. The 1.5 and 3.0 mol% Ce coatings exhibited slightly lower conductivities than LST without Ce-coating. The conductivity decreased significantly when the Ce-coating was too high such as 6 mol%. All the results are shown in Fig. 3. The LST and Ce-LST were printed on (La₉ₒ₋₀.₀₂Sr₀.₀₂TiO₃)ₓ(La₀.₄Sr₀.₆Oₓ)₀.₄91 (LSBC) electrolyte to form half-cells. The half-cells were then measured using H₂ (anode side) and air (electrolyte side) atmospheres. The voltage-current density (V-I) and power density-current density (P-I) are compared in Fig. 4 for various half-cells measured at temperature of 700°C. The LST anode with Ce-coating increased the power performance of half-cell compared with the LST anode without Ce-coating. LST anode with suitable Ce-coating could behave high power density which is the half-cell of 3.0 mol% Ce-LST/LSBC in Fig. 4. Thus, the Ce coating on LST could enhance the electrical properties of LST/LSBC cell which may be the effect of Ce species diffusion into LST structure.