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Abstract
In this study, the co-doping ceria electrolyte of SOFCs operating at intermediate temperature (≦800 ℃) are prepared by using a low-temperature hydrothermal method.The co-doped ceria electrolyte which the dopants of different radius rare earth metal cation(Gd3+=0.1053nm, Y3+=0.1019nm) with (Nd3+=0.1120nm) co-doped into the ceria base materials, and the properties of powders,the charactivity of sintered bodies and the ionic conducters of electrolyte have been investigated.
The crystallinities of Ce0.8Nd0.1Gd0.1O1.9 (NGDC) and Ce0.8Nd0.1Y0.1O1.9 (NYDC) powders are increased with increasing of hydrothermal temperature form 100℃ to 180℃,the grain-size also increased with the same temperature ranged from 3nm of 100℃ to 7nm of 180℃. The relative densities of NGDC and NYDC powders which sintering at 1500℃ for 2 hours can be obtained the maximum values of 98 % and 96 % , respectively. It is indicated that the sintering bodies are dense, but the NGDC is more dense than of NYDC.For the electric conductivity testing, the best conductivities will be obtained at 1073K of operating temperature when NGDC powders prepared at 160℃ and NYDC powders prepared at 180℃ after sintering 1500℃ for 2h in the air. On the other hand, the conductivities of NYDC are better than those of NGDC due to the hydrothermal temperature range. At 1073K, the conductivities of the co-doped samples reached the maximum of 4.3x10⁻ U+B2Scm⁻ U+B9 for NYDC and 3.9x10⁻ U+B2Scm⁻ U+B9 for NGDC, respectively.
For the lattice constant of sintering bodies, NYDC has a smaller lattice constant than the of NGDC for different hydrothermal temperature range. Because the radius of Gd3+ is larger than that of Y3+, therefore the lattice of NGDC is more inflation than NYDC. On the other hand, the active energy of NYDC electrolyte is lower than NGDC from the slope of Arrhenius plot.
On the other hand, the NGDC and NYDC powers prepared at 160℃ and 180℃ hydrothermal temperature, and then the Ce0.8Nd0.2-xGdxO1.9 (X =0~0.2) which sintering at 1500℃ for 2 hours can be obtained the maximum relative density of 98% with Gd3+ substitution at x=0.1 .Another, same result can be achieved in Ce0.8Nd0.2-xYxO1.9(X=0~0.2) electrolytes which prepared with can calcined at 500℃ before sintering procedure. The maximum relative density will be reached, form 96% of without calcination to 98% of with pre-calcine. Therefore, the calcination is necessary for NYDC powers. At 1073K the conductivity, of Ce0.8Nd0.2-xGdxO1.9 (X =0~0.2) has a maximum value of 3.9x10⁻ U+B2 Scm⁻ U+B9 at x=0.1, the same result can be found Ce0.8Nd0.2-xYxO1.9(X

=0~0.2) at x=0.1, the conductivity upgraded to a 6.0x10⁻ U+B2Scm⁻ U+B9 compare with 4.3x10⁻ U+B2 Scm⁻ U+B9 of without calcinations.
Keyword: solid oxide fuel cell , NGDC ,NYDC , hydrothermal method , electrolyte.
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