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Author chia-ching su
Author's Email Address No Public.
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Abstract
The purpose of this study is to develop a new technique by using an electrochemical synthesis method to prepare the gadolinia-doped ceria (GDC), and taken CeCl3, Gd(NO3) and NH4Cl as the raw materials. The influence of different electrolytic conditions on the characteristics of deposited GDC powders and sinterbility of sintered bodies by using TEM, XRD, EDX, SEM, and AC impedance analysis were investigated.
In the different electrolytic temperatures of electrolyte, the crystalline sizes of deposited powders were increased from 3.5 nm to 5 nm with increasing of the electrolytic temperature. The morphologies of deposited GDC powders were different to the others that of below the electrolytic temperature of 65oC. The relative densities and conductivities of the sintered bodies also increased as increasing of the electrolytic temperature. The relative density could be reached to 96% and the conductivity was 6.43x10-3 S/cm at the operating temperature of 800oC and using the electrolyte temperature of 65oC.
The influence of various electrolytic potentials was investigated with the constant temperature of 65oC. The crystalline size was decreased from 3 nm to 5 nm with increasing of the electrolytic potential. The morphologies of deposited powders by using the electrolytic potentials of 3.5 V and 4.5 V both were different to compare with that deposited by 5.5 V and 6.5 V. The relative densities and electric conductivities increased with increasing of the electrolytic potentials. The relative density had a maximum value of 98%, and the conductivity could be reached to 2.54x10-2 S/cm by using the electrolytic potential of 6.5 V and the electrolytic temperature of 65oC.
The morphologies and compositions of the deposited GDC powders at a higher electrolytic temperature (65oC) and low electrolytic potential (3.5 or 4.5 V) had a singularly difference compared with the other electrolytic conditions, especially. This differences infered that the cause of the Gd(OH)2NO3 would be formed alone during this conditions. On the other hand, the GDC particles growth would be inhabited as the Gd(OH)2NO3 existed powder, and reduced the conductivities of sintered bodies.
Advisory Committee Wen-Chang Wu - advisor

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