Conductivity of Ag-doped $BaCe_{0.9}Y_{0.1}O_3$

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The partially substituted $BaCeO_3$–based ABO_3 perovskite-type oxide is well known as mixed ionic electronic conductors (MIECs) and used in many solid-state electrochemical systems such as solid oxide fuel cells (SOFCs). There are many studies of an electrical property of $BaCeO_3$ substituted for Ce by a trivalent cation. However, the influence of Ba site on electrical property have not been investigated so far, except for A:B cation nonstoichiometry.

In this study, we investigate the influence of substitution for Ba in $BaCe_{0.9}Y_{0.1}O_3$ by Ag on the electrical property.

Ag-doped $BaCe_{0.9}Y_{0.1}O_3$ (BCY) was prepared by using solid-state reactions. The desired amount of $Ba(CH_3COO)_2$, $Ce(CH_3COO)_4{\cdot}H_2O$, $Ag(CH_3COO)$, and Y_2O_3 materials were mixed in a mortar with a pestle, and calcined in air at 1400°C for 24h. The obtained powder was ground using a planetary ball mill with zirconia balls for 24h at 250 rpm. The powder was pressed into the disk at hydrostatic pressure of 2.5 ton cm^{-2}, which sintered at 1650°C for 10h in air. Both sides of the sintered disk were polished. Platinum paste was painted on the polished surfaces and fired at 1000°C for 2h. Electrical conductivity was measured using ac impedance method.

XRD patterns of BCY and Ag-doped BCY show the perovslite structure of $BaCeO_3$ (Fig.1). Electrical conductivity measured in wet hydrogen and dry oxygen is shown in Fig.2 and Fig.3, respectively. Substitution for Ba by Ag increases the conductivity in wet hydrogen and decreases it in dry oxygen compared with BCY.

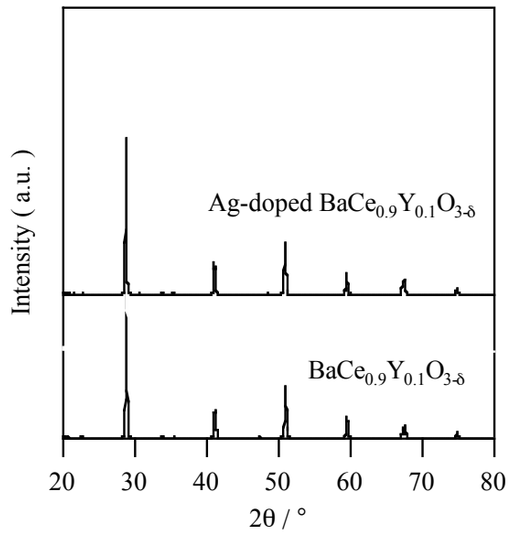

Fig.1. XRD patterns of BCY and Ag-doped BCY.

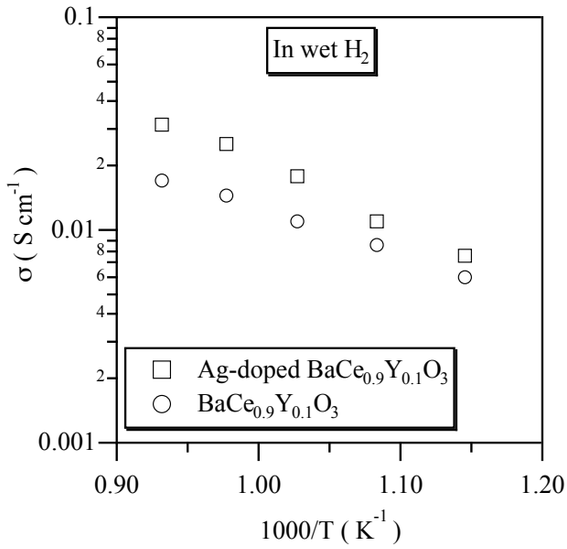

Fig.2. Electrical conductivity in wet hydrogen.

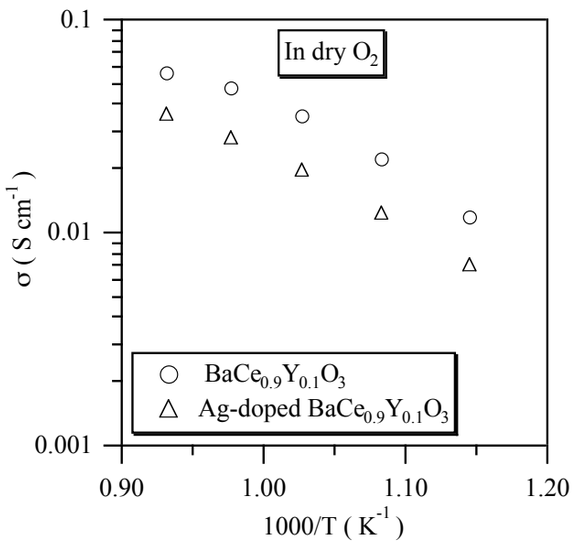

Fig.3. Electrical conductivity in dry oxygen.