Effect of Mn on the Characterization of Layered Perovskite $\text{NdBaCo}_{2-x}\text{Mn}_x\text{O}_{5+\delta}$ ($x=0.5, 1, 1.5, 2$) as Cathode Materials for IT-SOFCs

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$\text{NdBaCo}_{2-x}\text{Mn}_x\text{O}_{5+\delta}$ ($x=0.5, 1, 1.5, 2$) samples are synthesized via sol-gel method. The effect of Mn on the crystal structure, thermal expansion, electrical conductivity and electrochemical properties of $\text{NdBaCo}_{2-x}\text{Mn}_x\text{O}_{5+\delta}$ ($x=0.5, 1, 1.5, 2$) have been investigated. The lattice parameter of $\text{NdBaCo}_{2-x}\text{Mn}_x\text{O}_{5+\delta}$ decreases when Mn increasing. The substitution of Mn for Co significantly lowers the thermal expansion coefficient (TEC) which consequently improves the mechanical compatibility with the electrolyte SDC. Although the electrical conductivity and the electrochemical performances of $\text{NdBaCo}_{2-x}\text{Mn}_x\text{O}_{5+\delta}$ ($x=0.5, 1, 1.5, 2$) decrease with Mn increasing, $\text{NdBaCo}_{1.5}\text{Mn}_{0.5}\text{O}_{5+\delta}$ and $\text{NdBaCoMnO}_{5+\delta}$ have better electrochemical performance and the R_p are $0.07\Omega\text{cm}^2$ and $0.10\Omega\text{cm}^2$ at 800°C respectively, which can accord with the electrochemical performance requirement of IT-SOFCs cathode materials. $\text{NdBaCoMnO}_{5+\delta}$ provides a tradeoff relationship between TEC and electrochemical performance.

Keywords: IT-SOFCs; cathode; thermal expansion coefficient; electrochemical performance.

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