A mechanistic study of phase transition from simple perovskite to layered one with Co ex-solution for enhanced anode material in solid oxide fuel cell

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The phase transition of normal perovskite structure to the layered one under reduction conditions has been reported to significantly increase the catalytic activity and stability of $Pr_{0.5}Ba_{0.5}MnO_{3-\delta}$ (PBMO) as an anode material in solid oxide fuel cell (SOFC). However, the detailed mechanism and driving force for the phase transition is still unclear. In addition, to develop a superior anode material in SOFC, metal ex-solution under reduction conditions has been known as an effective strategy to well-distribute transition metal nanoparticles (NPs) over the surface. When Co dopants are introduced into PBMO (PBMCO), the phase transition from PBMCO to the layered PBMCO (L-PBMCO) is accelerated with the Co ex-solution. In this study, we focused on the detailed process of the phase transition from PBMO to L-PBMO and Co ex-solution under reducing environments. For the practical application of ex-solved NPs on L-PBMO, we also investigated the catalytic activity of ex-solved Co NPs. Our results can be widely used to design high performance perovskite-based redox catalysts as well as anode materials in SOFC.