Charateristics of $(Sr_{0.92}Y_{0.08})_{0.85}Ti_{1-x}Ni_xO_{3-\delta}$ (x=0.05, 0.10, 0.15, 0.20) perovskites for internal dry methane reforming in solid oxide fuel cells

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Perovskite with A-site deficiency is promising candidate due to introduction of oxygen vacancy for ionic conductivity and nano-sized exsolution of B component with metal phase for catalytic activity. Herein, Ni-doped $Sr_{0.92}Y_{0.08}TiO_3$ perovskite has been investigated to improve the catalytic activity for CO_2 dry internal reforming of methane in solid oxide fuel cells. $(Sr_{0.92}Y_{0.08})_{0.85}Ti_{1-x}Ni_xO_{3-\delta}$ (x=0.05, 0.10, 0.15, 0.20) perovskite with A-site deficiency is prepared by pechini method and compared to stoichiometric $Sr_{0.92}Y_{0.08}Ti_{1-x}Ni_xO_{3-\delta}$ (SYTN15) perovskite. $(Sr_{0.92}Y_{0.08})_{0.85}Ti_{0.85}Ni_{0.15}O_{3-\delta}$ (SYTN(+)15) shows the highest methane conversion with 93% and carbon dioxide conversion with 86%. In addition, the SYTN(+)15 results to the lowest decreasing rate of the methane conversion with 1.86% drop for 50h. The SYTN(+)15 shows better catalytic performance by 10% for dry reforming of methane (DRM) comparing to the SYTN15. The cell performances of the SYTN(+)15 and the SYTN15 are 60.05 and 28.50mW/cm2, respectively. Consequently, A-site deficiency catalyst, SYTN(+)15 exhibits excellent catalytic activity for DRM and sufficient electrochemical property for SOFC anode materials.