

# Oxygen Electrocatalysis on Cobalt-Based Layered Perovskite Oxychlorides in Alkaline Media

Yuto Miyahara, Kohei Miyazaki, Tomokazu Fukutsuka, Takeshi Abe

Graduate School of Engineering, Kyoto University, Nishikyo-ku, Kyoto 615-8510, Japan

E-mail: miyahara@elech.kuic.kyoto-u.ac.jp

Metal-air rechargeable batteries have attracted much attention because of their high theoretical energy densities. Since development of highly-active oxygen electrocatalysts is one of the biggest challenges for their commercialization, many researchers have been tried to find better oxygen electrocatalysts. Among them, perovskite-type compounds have been known to show good oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) activities<sup>[1,2]</sup>. In almost of all cases, while studies on their activities based on their cation choices or compositions have been extensively conducted, those based on their anion choices or compositions have been rarely conducted. In the present research, therefore, measurements of oxygen electrocatalysis on  $\text{Sr}_2\text{CoO}_3\text{Cl}$  and its related perovskite oxychlorides in alkaline media were carried out.

$\text{Sr}_2\text{CoO}_3\text{Cl}$  was synthesized by a solid-state method<sup>[3]</sup>. For comparison of its ORR and OER activities,  $\text{LaSrCoO}_4$ , which has the same crystal structure and valence state of cobalt ion, and  $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_{0.8}\text{Fe}_{0.2}\text{O}_{3-\delta}$  (BSCF), which is known as a highly-active OER electrocatalyst, were used. Hydrodynamic voltammetry was carried out by a three-electrode cell using a glassy carbon rotating disk electrode, on which catalyst layers consisting of  $250 \mu\text{g cm}^{-2}$  perovskites,  $50 \mu\text{g cm}^{-2}$  Vulcan XC72 (Cabot), and  $50 \mu\text{g cm}^{-2}$  AS-4 (Tokuyama) were formed.

ORR measurement clarified that while ORR activity of  $\text{LaSrCoO}_4$  was negligible,  $\text{Sr}_2\text{CoO}_3\text{Cl}$  obviously showed ORR activity. Moreover, OER activity of  $\text{Sr}_2\text{CoO}_3\text{Cl}$  (Fig.1) was much higher than that of  $\text{LaSrCoO}_4$ , and as high as that of BSCF. Above results clearly demonstrates that chloride incorporation into the layered perovskite structure is an effective strategy not only to add its ORR activity, but also to enhance its OER activity. Detailed discussion about ORR and OER activities of other related perovskite oxychlorides, and why the oxychloride showed such good bifunctional activity will be presented in the poster.

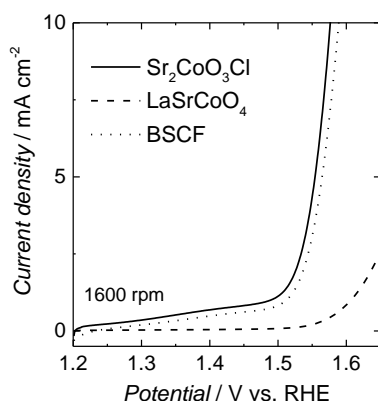


Fig. 1. OER polarization curves of (solid line)  $\text{Sr}_2\text{CoO}_3\text{Cl}$ , (dashed line)  $\text{LaSrCoO}_4$ , and (dotted line)  $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_{0.8}\text{Fe}_{0.2}\text{O}_{3-\delta}$  (BSCF) in  $1 \text{ mol dm}^{-3}$  KOH solution.

## References:

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