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# Oxygen Evolution Overpotential of Pb-based Insoluble Anode Containing Ru Oxide Powders Prepared by Liquid-phase Reaction and Heating

Hiroki TAKAHASHI[1], Yuuji OZAWA[1], Keisuke OHKUBO[1], Masami TAGUCHI[1] and Kazunari SUZUKI[2]

[1]Department of Materials Science, Graduate School of Engineering Science, Akita University, Akita 010-8502, Japan
[2]Metallurgical Laboratory, DOWA METALS & MINING CO., LTD., Akita 011-0911, Japan
*E-mail : tkhshrk@gipc.akita-u.ac.jp*

Ruthenium oxide powders were produced by the reaction of an $RuCl_3$ solution with $H_2O_2$, followed by heating of the resulting precursor at a temperature between 200°C and 600°C in air. Pb-based anodes containing these heated products of 1.0 mass% were prepared by the powder-rolling method, and the effect of the heated product as an electrode catalyst on lowering the anode potential was investigated in order to develop an energy-saving insoluble anode for Zn electrowinning. Based on XPS results, $RuO_2$ with a significant amount of $RuO_2 \cdot nH_2O$ was produced by heating the precursor at 250°C or lower. The ratio of $RuO_2$ to $RuO_2 \cdot nH_2O$ increased remarkably above 300°C and the potential of the Pb-based anode decreased in inverse proportion to the $RuO_2$ content of the heated product. The lowest anode potential of 1.72 V vs. NHE, which was about 360 mV lower than that of the anode with the unheated precursor, was observed for the Pb-based anode containing the product heated at 400°C. However, the anode potential of the Pb-based anode increased again when the heating temperature was 500°C or higher. The subsequent increase in the anode potential was probably caused by a decrease in the active sites of the oxygen evolution reaction, that is, the grain growth of the heated product decreased the effective reaction area of the $RuO_2$ catalyst.

***Keywords*** : Ruthenium Oxide, Oxygen Evolution Overpotential, Liquid-phase Reaction, Insoluble Anode, Zinc Electrowinning