JASMAC
Conference of the Japan Society of Microgravity Application

OR3-8

水および固体酸化物の各種電解による酸素発生挙動解析

Investigation of Oxygen Evolution Behavior for Electrolysis of Water and Solid Oxide

鈴木祐太 [1], 福中康博 [1], 後藤琢也 [1],
Yuta SUZUKI[1], Yasuhiro FUKUNAKA[1], and Takuya GOTO[1]
1 同志社大学, Doshisha University

In-situ resource utilization (ISRU) to generate energy and to supply oxygen and lunar base construction materials is mandatory for sustainable space exploration[1-3]. Electrochemical/materials processing is one of the attractive methods for generating oxygen and hydrogen and manufacturing useful metallic materials such as Si for a self-propagated PV power system from water derived from lunar ice, mineral resources (solid metal oxide) in lunar regolith, and carbon dioxide derived from manned space activity.

In the present study, the authors focused on the electrochemical gas evolution phenomena from water and solid metal oxide. For controlling gas evolution process by electrolysis, understanding of the physicochemical interfacial phenomena at electrode/electrolyte interface, as well as the development of non-consumable oxygen evolving anodes for metal extraction in molten salt, is indispensable. We investigated gas evolution behavior at metal nanowire electrode in aqueous solution under atmospheric pressure. The nanowire electrode was prepared by electrodeposition process (**Fig.1**). Electrochemical measurement combined with optical microscopic observation revealed the relationship between nanowire structure and gas evolution behavior (**Fig.2**). The electrochemical/materials processing newly encountered in ISRU greatly contributes to the new frontier of materials science and technology.

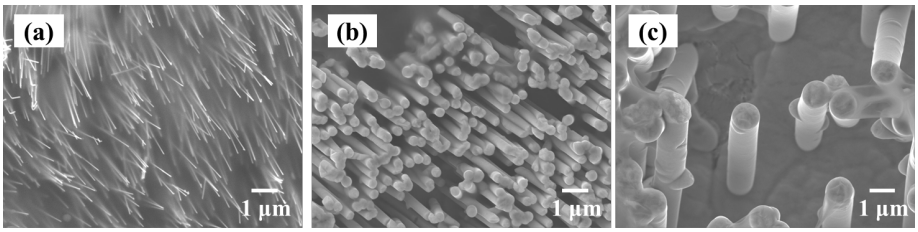

Fig. 1 SEM images of Ni nanowires as cathode materials prepared by electrodeposition process in aqueous solution.

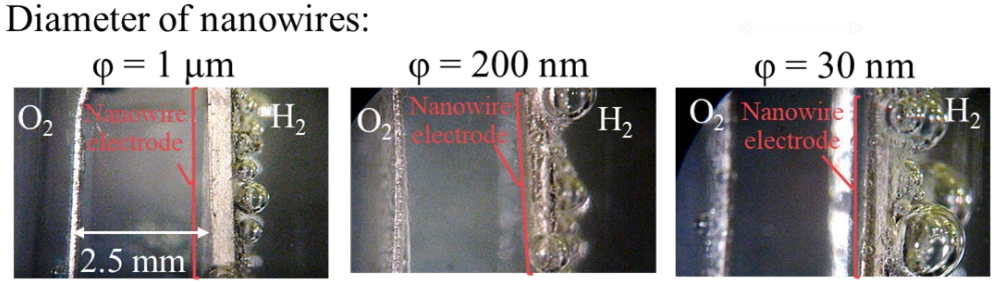

Fig. 2 Optical microscopic images during oxygen and hydrogen gases evolution by electrolysis of 25 wt.% KOH aqueous solution.

References

1) G. S. Jackson, S. Elangovan, and P. E. Hintze: Electrochem. Soc. Interface **29** (2020) 65.

2) D. Kornuta, A. Abbud-Madrid, J. Atkinson, J. Barra, G. Barnhard, D. Bienhoff, B. Blair, V. Clarkg, J. Cyrus, B. DeWitt, C. Dreyer, B. Finger, J. Goff, K. Ho, L. Kelsey, J. Keravala, B. Kutter, P. Metzger, L. Montgomery, P. Morrison, C. Neal, E. Otto, G. Roesler, J. Schier, B. Seifert, G. Sowers, P. Spudis, M. Sundahl, K. Zacny and G. Zhu: REACH-Rev. Human Space Expl., **13** (2019) 100026.

3) T. Goto, Y. Sakanaka, A. Mutrata, K. Iwami, and T. Ishikawa: Space Utiliz. Res., **30** (2016) 1.