

The Kinetics of Hydrogen Transport through Metal-Hydride
Electrodes by Analysis of Anodic Current Transient
애노딕 전류추이곡선의 해석을 통한 금속 수소화물 전극에서의
수소 이동에 관한 속도론적 연구

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Hydrogen transport through such metal-hydride electrodes as $Mm(Ni_{3.6}Co_{0.7}Mn_{0.4}Al_{0.3})_{1.12}$ and $Zr_{0.65}Ti_{0.35}Ni_{1.2}V_{0.4}Mn_{0.4}$ was investigated in 6 M KOH solution by employing potentiostatic current transient technique. Especially, the anodic current transient was measured as a function of the hydrogen discharging potential, in an attempt to establish the boundary conditions at the electrode surface during hydrogen extraction. From the dependencies of the anodic current transients in shape and value on the hydrogen discharging potential, it is recognised that the constraint by Butler-Volmer behaviour is effective at the electrode surface during hydrogen extraction below the transition discharging potential, whereas the constraint of constant concentration is valid above the transition discharging potential. This means that hydrogen extraction from the $Mm(Ni_{3.6}Co_{0.7}Mn_{0.4}Al_{0.3})_{1.12}$ and $Zr_{0.65}Ti_{0.35}Ni_{1.2}V_{0.4}Mn_{0.4}$ electrodes proceeds under the same boundary conditions at the electrode surface, as does hydrogen extraction from the Pd foil electrode. In addition, the differences in the kinetic parameters governing hydrogen transport between through two different metal-hydride electrodes which were estimated from the anodic current transients were discussed in terms of the differences in the composition and structure between the electrodes.

Reference

1. J.-N. Han, M. Seo and S.-I. Pyun, J. Electroanal. Chem. 499 (2001) 152.