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The Kinetics of Hydrogen Transport through $Zr_{0.65}Ti_{0.35}Ni_{1.2}V_{0.4}Mn_{0.4}$
Electrode by Analysis of Anodic Current Transient

에노딕 전류추이곡선의 해석을 통한 $Zr_{0.65}Ti_{0.35}Ni_{1.2}V_{0.4}Mn_{0.4}$
전극에서의 수소 이동에 관한 속도론적 연구

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Hydrogen transport through $Zr_{0.65}Ti_{0.35}Ni_{1.2}V_{0.4}Mn_{0.4}$ electrode was investigated in a 6 M KOH solution by using potentiostatic current transient technique. In particular, 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 analysis of the anodic current transient, it was recognised that in the presence of the oxide scale the constraint by Butler-Volmer behaviour is effective at the electrode surface during hydrogen extraction below the transition discharging potential, whereas the constraint by hydrogen transfer of absorbed state to adsorbed state is valid above the transition discharging potential. In case that the electrode was previously immersed in a boiling KOH solution to eliminate the oxide layer on the electrode surface such as ZrO_2 , on the other hand, it was found that below the transition discharging potential hydrogen transport through the electrode proceeds under the constraint by Butler-Volmer behaviour at the electrode surface, while above the transition discharging potential hydrogen transport through the electrode proceeds under the constraint of constant concentration. It is thus suggested that the oxide layer formed on the electrode surface acts as the effective barrier to hydrogen extraction, especially by reducing the rate of hydrogen transfer from absorbed state to adsorbed state, and consequently the rate-controlling step of hydrogen transport is highly dependent upon the presence or absence of the oxide scale on the electrode.

References

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2. J.-W. Lee, S.-I. Pyun, and S. Filipek, *Electrochim. Acta*, 48 (2003) 1603.