Regeneration Rate Study on the Disproportionated ZrCo Hydride Material

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ZrCo, an intermetallic compound, is known as an excellent getter material of the hydrogen isotope gas, but it has one major drawback in terms of disproportionation which is caused by the repetitive hydriding and dehydriding cycles of the ZrCo hydride material under high temperature and/or high pressure conditions. Regeneration of the disproportionated ZrCo hydride is, therefore, one way to maintain the whole hydrogen-absorbing capability of a fresh getter material, so that it is expected to pursue a cyclic operation without any performance limitation. Using a thermal rearrangement, annealing, an energy level reduction of the ZrH_2 and $ZrCo_2$, which are presumptive stable forms of the deactivated ZrCo hydride, to obtain complete cyclic sorption ability for the ZrCo itself at rather a high temperature region is necessary for sustaining a getter performance[1,2]. In this study the Sivert apparatus was used to measure the regeneration rate of the partially degraded ZrCoHx system in several annealing temperature ranges. The performance recovered by regeneration of the deactivated ZrCo was analyzed by means of the PCT isotherm. After annealing, the chemical property of the regenerated ZrCo was analyzed by XRD, DSC and so forth. In addition, the superficial physical properties of the regenerated ZrCo were also compared with the fresh ZrCo material.

[1] S. Konish et al., “Reversible disproportionation of ZrCo under high temperature and hydrogen pressure”, J. Nuclear Materials 223, 294-299 (1995).
[2] M. Hara et al., “Isotope effects on disproportionation of ZrCo”, HIRC Report 16 (Toyama University), 69-79, (1996).