

Small measurement system of effective thermal conductivity for disk type solid-state hydrogen storage materials

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The effective thermal conductivity (ETC) has been evaluated in relatively large hydrogen vessels as compared to small amount of samples used for fundamental qualitative research on kinetics. Therefore, the ETCs of hydrogen storage mediums have been investigated on several well-known materials such as LaNi₅ and FeTi. To address this issue, compact ETC measurement cell requiring typical sampling size of standard volumetric apparatus for the kinetic studies was developed and verified using LaNi₅ as a reference material. Especially, the measured ETCs for LaNi₅ showed good agreement with the ETC modeling results as a function of gas pressure and filling gas. This small measurement system was applied for the ETC evaluations for MgH₂ storage materials. Furthermore, the ETCs of disk type MgH₂ compacts prepared by pressing with several additives were investigated to develop effective hydrogen storage tanks. This work demonstrates that the small ETC measurement system is useful to evaluate heat transfer resistance of hydrogen storage material from small amount of sample obtained at the basic research level.