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Abstract

Effects of alloying elements (beryllium, hafnium, niobium, tin and yttrium) and of cold-swaging on the redistribution of hydrogen in zirconium with various initial hydrogen concentrations have been examined after anneals under given temperature differences.

For low hydrogen concentration, the alloying elements did not greatly affect the value of the heat of transport, except for the beta-martensite Zr/1 wt% Nb alloy which showed a low value. Cold-swaging enhanced the migration of hydrogen toward the cold end. The heat of transport of the worked specimens could not be calculated accurately.

For high hydrogen concentration, the $\alpha/(\alpha+\delta)$ interface moved toward the cold end. As the initial concentrations were different from alloy to alloy, a normalization process was employed. The resulting comparison showed that niobium accelerated the movement of the interface. This was attributed to the fine grain size of the alloy. The movement of the interface was also enhanced by cold-swaging which probably produced many defects and elongated grain boundaries along the temperature gradient, thereby accelerating diffusion of hydrogen toward the cold end.

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