INVESTIGATION OF THE HYDROGEN INTERACTION WITH $Ti_{0.9}Zr_{0.1}Mn_{1.3}V_{0.5}$ BY CALORIMETRIC METHOD

Anikina E.Yu.*, Verbetsky V.N.
Chemistry Department, Lomonosov Moscow State University, 119899 Moscow, Russia
**E-mail: anikina@hydride.chem.msu.ru*

Introduction

This work is continuation of our earlier study [1] of hydrogen interaction with intermetallic compound (IMC) AB_2-type $Ti_{0.9}Zr_{0.1}Mn_{1.3}V_{0.5}$. The measurements were carried out in twin-cell differential heat-conducting calorimeter Tian-Calvet type connected with the apparatus for gas dose feeding, that permitted us to measure the dependencies of differential molar enthalpy of desorption (ΔHd) and equilibrium hydrogen pressure (P) on hydrogen concentration x (x=[H]/[IMC]) at different temperatures simultaneously. The measurements were carried out at 150°C, 170°C and 190°C and hydrogen pressure up to 60 atm.

Result and discussion

It could be see on the plot of P-x dependence, that there was a small folder in the hydrogen concentration range 0.80<x<1.00 (see fig.1).

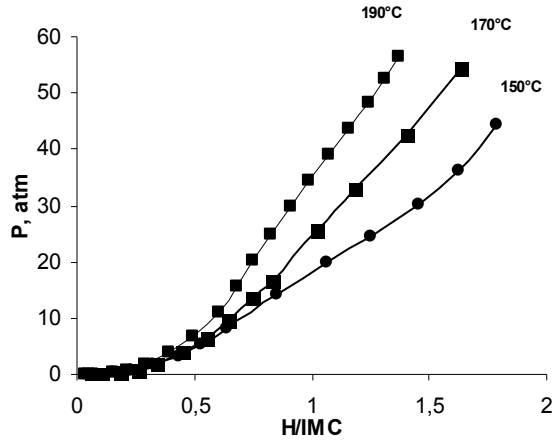

Fig.1. Desorption isotherms in the $Ti_{0.9}Zr_{0.1}Mn_{1.3}V_{0.5}$-$H_2$ system.

Contrary to lower temperatures [1] three segments could be marked on the plot of |ΔHd|-x dependence, namely: fist –solid α- solution of hydrogen in IMC, where values of |ΔHd| decreased with a rise of x, second segment with constant values of |ΔHd| (at 150°C 0.40<x<0.85, |ΔHd|=28.91±kJ/molH_2) and at last third segment 0.90<x<1.50, where values of |ΔHd| monotonically increased up to ~ 40kJ/molH_2. The same dependence of |ΔHd|-x was obtained at 170°C, but constant values of |ΔHd| in this segment (0.40<x<0.80) were a few less(|ΔHd|=27.34±0.39 kJ/molH_2).

On the |ΔHd|-x isotherm at 190°C the region of hydrogen solid solution in IMC could be sharply marked, where values of |ΔHd| decreased from 45 kJ/molH_2 (x=0) to 25kJ/molH_2 (x=0.5), and after that there were three segments within the range of which values of |ΔHd| monotonically decreased from 35kJ/molH_2 (at the beginning range) to 25kJ/molH_2 (at the end of a range) (see fig. 2).

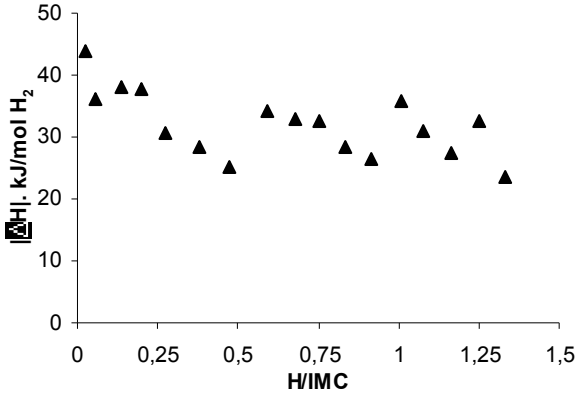

Fig.2. Calorimetric data for the desorption of hydrogen for $Ti_{0.9}Zr_{0.1}Mn_{1.3}V_{0.5}$ at 190°C.

We assumed, that it may be connected with the order and the degree of the filling by hydrogen different interstitial sites of metallic matrix $(24(l)_1$, $12(k)_1$ and $6(h)_1)$ as it was pointed out in the work [2].

Acknowledgements

The work has been partially supported by the RFBR Grant № 03-03-33023

References

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2. Mitrokhin, S.V., Smirnova, T.N., Somenkov, V.A., Glazkov, V.P., and Verbetsky, V.N. (2003) Structure of (Ti,Zr)-Mn-V nonstoichiometric Laves phase and $(Ti_{0.9}Zr_{0.1})(Mn_{0.75}V_{0.15})D_{2.8}$ deuteride, *J.Alloys and Compounds* **356-357**, 80-83.