

THE PHASE TRANSITIONS IN ZIRCONIUM AT THE ISOTHERMAL HYDROGENATION

Zaginaichenko S.Yu.*, Schur D.V., Matysina Z.A., Vlasenko A.Yu., Shvachko N.A.

Institute for Problems of Materials Science of NAS of Ukraine, Laboratory №67,
3 Krzhyzhanovsky str., Kyiv, 03142 Ukraine

* Fax: 38 (044) 424-0381, E-mail: shurzag@materials.kiev.ua

Introduction

Understanding the processes proceeding in materials of the first wall and in jackets of fuel elements is of high importance to provide safe operation of nuclear reactors. Knowledge of special features in interaction of metals from which the wall and the jackets are made with atomic hydrogen is an important condition for their safe operation.

This work considers the problems on interaction of zirconium and zirconium-based alloys with atomic hydrogen.

Results of discussion

The present research paper suggests the high-sensitive kinetic method of investigation for determination of solid phases sequence in transition metals, for direct fixing of the moment of the phase formation from the kinetic curves and for estimation of hydrogen content in them by thermogravimetric methods. For that purposes the plasma chemical plant has been created. The

experimental technique permits to observe directly the formation of hydride phases of high pressure under pressure of 27 Pa and to obtain hydrides of predetermined composition.

Experimental data of isothermal interaction between atomic hydrogen and zirconium at the temperatures of 613, 723, 873 and 1073 K are presented in this work. The X-ray phase analysis of specimens have been performed. The surface topography have been investigated by the method of scanning electron microscopy. The chemical composition of specimen surfaces have been studied by the method of Auger-electron spectroscopy.

The received kinetic effects have been interpreted on the basis of fulfilled analysis and zirconium hydrogen binary constitution diagram.

Acknowledgment

The work has been performed under support of Science and Technology Center in Ukraine, Project # Uzb-131.