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HEAT RESISTANCE OF ZIRCONIUM-CROMIUM SURFACE ALLOYS*

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The state of affairs in the field of technology for the production of zirconium and its alloys is studied in a row of monographs, books and reviews, starting from the second half of the 20th century, for example [1, 2]. The methods of their production, properties, advantages and disadvantages, and the impact on properties of certain alloying elements are described in this works. One of the main alloying elements for zirconium alloys is chromium (Cr).

This paper presents the results of testing the heat resistance of Cr-Zr surface alloys. Cr-Zr surface alloys are formed by deposition of Cr films onto Zr substrates, followed by pulsed melting with a low-energy high-current electron beam. A comparison is made with the heat resistance of a Cr magnetron coating on a Zr substrate.

The tests were carried out in a muffle furnace in an air atmosphere at a temperature of 953÷973 K. The heat resistance was evaluated by the weight gain of the samples, weighing was carried out after 1-3 hours. The duration of the tests was 10 hours.

The effect of treatment with a low-energy high-current electron beam on the heat resistance of zirconium was not revealed in the work.

It is shown in the work that in order to increase the heat resistance of Zr, it is necessary to form protective layers of pure chromium with a thickness of more than 2 μm.

REFERENCES

[1] B. Lustman, F. Kerze, The metallurgy of zirconium, New York, McGraw-Hill, 1955.

[2] Azevedo C.R.F. “Selection of fuel cladding material for nuclear fission reactors. Review”, Engineering Failure Analysis, vol.18, p.1943–1962, 2011

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