

Wettability of 12Cr18Ni10Ti Reactor Steel by the Eutectic Alloy of PbBiLi

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The Pb44.5Bi55.5 eutectic alloy and its components are used as coolants in nuclear power plants, heat pipes, etc. [1, 2]. In the presented study the temperature dependence (TD) of wettability of 12Cr18Ni10Ti reactor steel by the eutectic alloy of PbBi and its ternary alloys with up to 20at.% of Li was measured, for the first time, in vacuum and in purified argon atmosphere. The eutectic alloy was prepared using Pb and Bi with no less than 99.9999% of the basis element. The measurement chamber included a high-resolution CMOS video camera that allowed imaging the alloy drops at no less than 5 frames per second. The drop profiles were automatically captured, processed, and the contact angles were determined using the sessile-drop method, with an error of 1.5% [3]. The wettability of 12Cr18Ni10Ti reactor steel by the eutectic alloy of PbBi was studied in the wide range of temperatures from the melting point to 1520 K. The temperature was controlled with the accuracy of ± 0.1 K using a chromel-copel thermocouple and a high-sensitivity (10-7V) electronic microvoltmeter G-1202.010. We found that the critical temperature of wettability for the system is at 1250K. We also observed that the wettability of 12Cr18Ni10Ti steel by the eutectic alloy of PbBi is significantly different in vacuum and in argon atmosphere, especially at high temperatures. It is therefore necessary to take the medium (vacuum, or inert gas and its pressure) into account when interpreting experimental data on critical temperatures of wettability.

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References

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