

Production of Intermetallic Alloys by Powder Metallurgy: the Distinguishing Features of the Hot Isostatic Pressing

Friday, 8 December 2017 08:50 (25 minutes)

We have proposed a following approach to determine the parameters of hot isostatic pressing (HIP) intend for consolidation of the powders from intermetallic alloys with a large prone to embrittlement at ambient temperatures. We analyze a temperature dependence of the mechanical properties (0.02 proof stress, 0.02) and diffusion characteristics (the diffusion coefficients in the bulk and along interfaces) of the alloy and use the following manner to a choice of the HIP parameters (the temperature THIP and the pressure PHIP). If one needs to conserve a small-grained microstructure in the compacted state after HIP, PHIP pressure at a given temperature has to be smaller than 0.02 and a condition of the large diffusion path of vacancies in the microstructure has to be fulfilled. When a significant coarsening of the microstructure under HIP is acceptable, PHIP pressure has to be larger than 0.02 without a control of diffusivity.

An ability of HIP to form different kinds of microstructures is especially important in a case of treating the materials having a large tendency to embrittlement at ambient temperatures. Here we have used such an approach to consolidation of the powders from intermetallic Ni3Al-base alloy and presented the data deal with microstructure and mechanical properties of this alloy.

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Materials

Primary author: Dr LOGACHEV, Alexander (JSC"Kompozit")

Co-authors: Dr BERESNEV, Alexander (JSC"Kompozit"); Prof. RAZUMOVSKII, Igor (JSC"Kompozit"
Chief researcher)

Presenter: Dr LOGACHEV, Alexander (JSC"Kompozit")

Session Classification: Materials