

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

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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, $\sigma_{0.02}$) 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 $\sigma_{0.02}$ 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 $\sigma_{0.02}$ without a control of diffusivity.

An ability of HIP to form differend 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

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