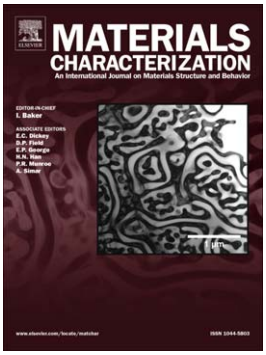

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PII: S1044-5803(14)00389-1
DOI: doi: 10.1016/j.matchar.2014.12.011
Reference: MTL 7764

To appear in: *Materials Characterization*

Received date: 23 August 2014
Revised date: 3 December 2014
Accepted date: 10 December 2014

Please cite this article as: Sun Y, Hu LX, Ren JS, Investigation on the hot deformation behavior of powder metallurgy TiAl-based alloy using 3D processing map, *Materials Characterization* (2014), doi: 10.1016/j.matchar.2014.12.011

Investigation on the hot deformation behavior of powder metallurgy TiAl-based alloy using 3D processing map

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Abstract

The deformation behavior of the powder metallurgy Ti-47Al-2Nb-2Cr alloy in hot working process was researched by the isothermal compression tests performed in the deformation temperature range of 950-1200℃ and the strain rate range of 0.001-0.1s^{-1} with true strain of 0.8. The constitutive equation which presented the flow stress as a function of the strain rate and deformation temperature was established for hot deformation of this alloy. The hot deformation apparent activation energy was calculated to be 337.501 kJ·mol^{-1}. The 3D processing maps were developed on the basis of experimental data and dynamic material model theory for the identification of the instability regions and optimization of hot processing parameters. It was found that the dynamic recrystallization of powder metallurgy Ti-47Al-2Nb-2Cr alloy occurs at two domains, one occurs in the temperature range of 1040-1060℃ and strain rates of 0.001-0.0015s^{-1}, with peak efficiency of power dissipation of 55.0% occurring at about 1050℃/0.001s^{-1}, the other occurs in the temperature range of 1180-1200℃ and strain rate of 0.003-0.01s^{-1} with peak power dissipation efficiency

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