An Investigation on the Elongation-porosity Relation in Sintered 17-4 PH STS

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Abstract

In the present study, powder injection molding (PIM) process, in which the porosity of sintered parts can be easily controlled, has been employed to produce sintered specimens with the various porosities from the initial stage of sintering and to the stage of nearly full density. A series of tensile tests has been conducted on these specimens at room temperature to elucidate the effect of a wide range of porosity. The material used in this study was 17-4 PH stainless steel, which is the precipitation hardenable stainless steel containing 4% of Cu and well known to show high strength and the high corrosion resistance at the same time. The 17-4 PH stainless steel powders used in this study were produced by the high-pressure water atomization method. Based on the results of tensile tests on the specimens with the various porosity, a new approach to predict the elongation of sintered materials has been carried out and a new framework combining neck growth model and ideal pore model has been established.

Research on MC Type Carbide in Nickel-based Superalloy Powders during Rapid Solidification

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Abstract

The morphology, structure and composition of carbide in FGH95 nickel-based superalloy powders prepared by plasma rotating electrode processing (PREP) and the carbide stability are investigated by experiment. The effect of solidification thermal parameters and non-equilibrium partition taking on the process of carbide formation during solidification is also analyzed. The results indicate that the geometry integrity of MC-type carbide in rapidly solidified FGH95 alloy powders changes from regular morphology into diversified morphology with powder size decrease. The carbide morphology and quantity in different size powder depend upon the changes of thermal parameters and non-equilibrium partition coefficient and composition of remainder liquid of final solidification and the diffusion rate of alloying elements during solidification. The decomposition of metastable MC-type carbide precipitated during rapid solidification and redistribution of alloy elements take place under heat treatment condition. And the metastable MC-type carbide transforms into stable MC-type carbide with regular morphology.