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## Phase evolution and densification behavior of MIM418 superalloy utilizing master alloy approach

Xiaowei Chen <sup>a</sup>, Lin Zhang <sup>a,\*</sup>, Ye Liu <sup>b</sup>, Xiaoyong Gao <sup>a</sup>, Dan Li <sup>c</sup>, Huifeng Lu <sup>a</sup>,  
Xuanhui Qu <sup>a</sup>

<sup>a</sup> Beijing Advanced Innovation Center for Materials Genome Engineering, Institute for Advanced Materials and Technology, University of Science and Technology Beijing, Beijing 100083, China

<sup>b</sup> School of materials Science and Engineering, Xiangtan University, Xiangtan, 411105, China,

<sup>c</sup> Quality Assurance Div. Laboratory, SAIC Volkswagen, Shanghai, 201805, China

\* Corresponding author: zhanglincs@163.com (Lin Zhang); Tel: +86-10-82377286; Fax:  
+86-10-62334311.

### Abstract

MIM418 superalloy was prepared by metal injection molding of master alloy powder and carbonyl Ni powder. Phase formation process and its evolution during heating process was followed by high temperature x-ray diffraction, and the relationship between phase transition, diffusion process and the densification behavior was discussed in detail. Microstructural characteristics of the samples during sintering process and the densification mechanism were investigated. Asynchronous diffusion of dissolvent elements,  $\gamma'$  phase and carbides were observed. Severe outward diffusion of  $\gamma'$  forming elements (Al) from the master alloy to the nickel powder leads to the precipitation of a large population of  $\gamma'$  phase in the temperature range of 700-900 °C. The mass transfer of  $\gamma$ -partitioning elements (Cr, Mo) almost accomplished at 1100 °C. The phase transformation of carbides evolves from non-equilibrium  $MC'$  carbides in the master alloy powder to  $M_{23}C_6$  carbides at 900-1100 °C, and finally to thermodynamically stable MC carbides in the homogenized sample. Accelerated

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