

EFFECTS OF PULSED MAGNETIC FIELD ON MICROSEGREGATION OF SOLUTE ELEMENTS IN K4169 NI-BASED SUPERALLOY

YANG Y., FENG X., LUO T., LI Y., TENG Y.

Institute of Metal Research, Chinese Academy of Sciences, China

E-mail: ysyang@imr.ac.cn

The effects of pulsed magnetic field (PMF) on microsegregation of solute elements during the solidification of K4169 Ni-based superalloy are investigated experimentally. The results show that PMF significantly affects the microsegregation of Al, Ti, Co, Cr and Nb elements in the alloy. However, the distribution behaviors are different for positive segregation elements and negative segregation elements. The microsegregation of positive segregation elements, Fe and Cr, is restrained effectively with the application of PMF. But the microsegregation of negative segregation elements, Al, Mo, Ti and Nb, is aggravated by the application of PMF.

A segregation model is established to reveal the mechanism of the distribution of elements with PMF. It is considered that, under the action of PMF, the jumping of solute atoms from the liquid phase to the solid phase is hindered, but the jumping of solute atoms from the solid phase into the liquid phase is promoted during solidification. As a result, the effective distribution coefficient of the solute atoms is reduced, which leads to reduction of the microsegregation of positive segregation elements and aggravation of microsegregation of negative segregation elements.