

CONTRIBUTIONS OF ATOM PROBE TOMOGRAPHY TO THE UNDERSTANDING OF NICKEL-BASED SUPERALLOYS

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The technique of atom probe tomography has been applied to many different commercial nickel based superalloys in order to characterize the microstructure of these complex engineering materials at the atomic level. The main types of microstructural characterization that have been performed on these materials are the determination of the size, morphology and compositions of the coexisting phases as a function of the multistage heat treatment, the investigation of the solute concentration profiles at interfaces, and the quantification of the solute segregation at grain boundaries. These types of characterizations will be described with a series of examples including the formation of fine precipitates within the central region of the $L1_2$ -ordered γ' phase in PW 1480, the evolution of the dual γ'/γ'' nature of secondary precipitates in Alloy 718, the interphase precipitation of the γ' phase at the primary γ'' - interface in Alloy 718, and the quantification of the level and spatial extent of the boron segregation at grain boundaries in a nickel-molybdenum superalloy.

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