

NET SHAPE PRECISION CASTING PROCESS SINGLE CRYSTAL TITANIUM ALUMINIDE TURBINE BLADES

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ABSTRACT

Net shape precision casting is the latest development to mass production of turbine blades accurately and at low cost. Lighter aircraft engines not only have the merit of being lighter themselves, but also lead to lighter engine support structures. Titanium aluminide is a new material for lighter aircraft engines. The present work aims at mass production of titanium aluminide blades. The basic components of a jet engine are a fan, a compressor, a combustion chamber, and a turbine, and the inside of the combustion chamber where the temperature is hottest must be able to withstand temperatures close to 2000°C. Heat-resistant alloys such as nickel alloys have the merit of excellent specific strength in high-temperature regions, but are difficult to process.

The wax molds were grouped around a central sprue through which molten metal was poured. By alternately layering ceramic slurry and stucco sand around the assembled wax molds, a casting mold was formed on the outside. Next, the wax molds on the inside were melted and discharged with an autoclave.

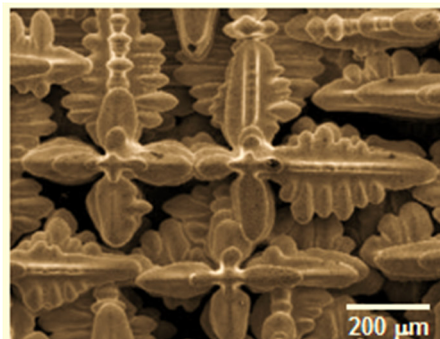


Figure 1: Scanning electron image showing the dendritic morphology of single crystal Ni-based superalloy

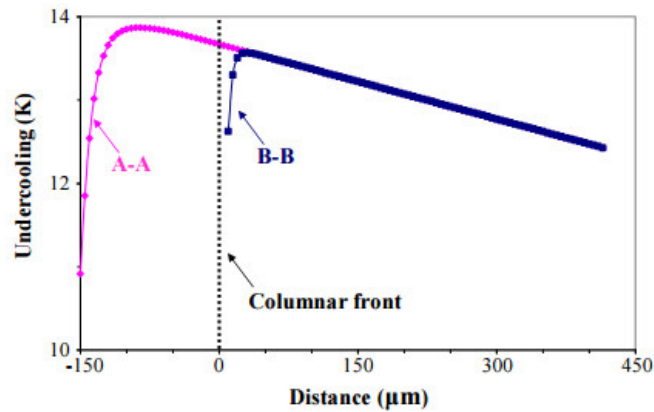


Figure 2: Undercooling in the liquid region.

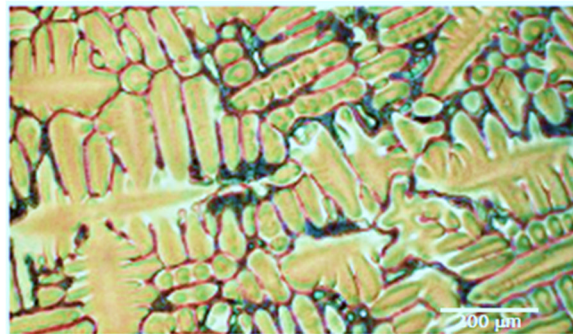


Figure 3: Scanning electron image showing the dendritic morphology of single crystal titanium aluminide turbine blades.

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