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Tensile and fracture toughness properties of MA957: implications to the development of nanocomposited ferritic alloys

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Abstract

A study to explore approaches to optimizing nanocomposited ferritic alloys was carried out on dispersion strengthened mechanically alloyed (MA) MA957, in the form of extruded bar stock. Previous studies had indicated that this alloy manifested superior high temperature strength and radiation stability, but was extremely brittle in notch impact tests. Thus our objective was to develop a combination of tensile, fracture toughness and microstructural data to clarify the basis for this brittle behavior. To this end, tensile properties and fracture toughness were characterized as a function of temperature in various orientations relative to the grain and inclusion structures. This database along with extensive fractography suggests that brittleness is due to the presence of a large volume fraction of impurity alumina stringers. In orientations where the effects of the stringers are reduced, much higher toughness was observed. These

results provide a path for alloy development approach to achieve high strength and toughness.



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Keywords

C0900; F0600; M0300; S1000

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