

305-062

SHORT-TERM CREEP PROPERTIES AND FRACTURE SURFACE OF 18 Ni (300) MARAGING STEEL PLASMA NITRIDED

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Maraging 300 is one of a family of maraging nickel steels which is martensitic yet ductile in the solution treated condition and attains ultrahigh strength through a single low temperature aging treatment and exhibits good ductility at high strength levels and excellent notch ductility. Applications of this alloy include aircraft structural components and rocket motor case. Plasma nitriding is a thermochemical treatment which has been used to improve several chemical and physical properties of steels, as corrosion and wear resistance, surface hardness and creep resistance. The objective of this work is to study the effect of plasma nitriding on the creep behavior and fracture surface of a maraging 300 solution annealed and aged. The creep tests were conducted on a standard creep machine at stress range of 200 to 500 MPa and temperature range of 550 to 650 °C. The creep properties of the plasma nitrided specimens were improved relative to those of untreated specimens. Dominant type of failure was ductile showing a typical cup-and-cone fracture morphology. However, the plasma nitriding treatment decreased the ductility (reduction in area) likely as a result of premature cracking of the compound layer. Improvement in creep resistance and reduction of ductility can be associated to the formation of Fe₄N and Fe₃N nitrides on the alloy surface due to the barrier against oxygen diffusion and top surface hardening.