Applied Heat Treatment and its Influence on IN 718 Alloy Fatigue Life

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The Inconel 718 type is a high-strength, corrosion-resistant, and hardenable alloy with good tensile, fatigue, creep, and rupture strength. Mechanical properties of this alloy are strongly depended on microstructure and from presence of structural features such are gamma double prime (γ′), gamma prime (γ′) and delta (δ) phases. Mentioned phases precipitate at various temperature ranges and Nb content as well. The Nb content necessary for delta phase formation is 6 – 8%, the γ′ formation is 4% or higher. When is Nb content lower than 4% the γ′ is formed. Heat treatment of such alloys is commonly reported with T-T-T diagrams (Time-Temperature-Transformation). Temperatures above 700°C cause transition of metastable gamma double prime (γ′- Ni_3Nb bct ordered $D0_{22}$) into more stable delta (δ – Ni_3Nb orthorhombic) but due to its morphology less desired. The Low Cycle Fatigue (LCF) tests were provide at room temperature via three point flexure loading on Zwick/Roell Amsler 150HFP 5100. After fatigue test the S-N curve was ploted and SEM fractography was done as well.

Keywords: Wrought iron-nickel base alloy 718; Heat treatment; Intermetalic phases; Low-cycle fatigue life; S-N curve

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