

动力机械与工程

617合金760℃时效组织结构及力学性能分析

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摘要: 研究了617合金在760℃时效过程中组织结构变化及其对力学性能的影响。结果表明, 合金在760℃时效过程中, 析出相有M23C6碳化物和 -Ni3(Al, Ti); 分布于晶内, M23C6分布于晶内和晶界。整个时效过程中, 晶内和M23C6稳定性好。晶界M23C6碳化物在时效初期(1 000 h)稳定性好。合金时效300 h后, 硬度和强度明显增大; 时效1 000 h后达到最大值, 这是晶界、晶内协调强化的结果; 时效3 000 h后, 晶界M23C6颗粒聚集长大, 弱化了晶界强化和Mo的固溶强化作用, 从而降低了强度和硬度。时效后, 室温冲击吸收能量和断后伸长率明显降低是由于晶界析出M23C6碳化物弱化界面结合强度。

关键词: 617合金 组织结构 力学性能 时效

Analysis of Microstructure and Mechanical Properties of Alloy 617 Aged at 760℃

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Abstract: The evolution of microstructure and its effect on mechanical properties of the INCONEL Alloy 617 aged at 760℃ was investigated. The results indicate that the precipitates of the aged alloy are intragranular M23C6 carbide and g¢ -Ni3(Al, Ti), intergranular M23C6. During aging, M23C6 carbide and g¢ inside grains remained almost stable. Intergranular M23C6 carbide showed good stability in the early stage of aging (1000 h). The alloy aged for 300 h showed an obvious increase of strength and hardness compared with as-received condition. Synergistic effect of intra-granular and grain boundary strengthening could be responsible for a maximum value of the hardness and strength for the alloy aged for 1000 h. The obvious growth of M23C6 carbide at grain boundaries with increasing aging time to 3000 h resulted in a marginally decrease of grain boundary strengthening and Mo solution strengthening, thus leading to a slight decrease of hardness and strength. A decrease of the impact absorbed energy and elongation of the alloy after aging is attributed to the reduction of the bonding interface strength when M23C6 carbide precipitated on grain boundaries.

Keywords: INCONEL alloy 617 microstructure mechanical properties aging

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