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微纳技术与精密机械

微米/纳米复合结构逆转变奥氏体组织控制

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摘要： 为了控制微米/纳米复合结构逆转变奥氏体组织，研究了冷变形及退火工艺参数对316L奥氏体不锈钢逆转变组织和力学性能的影响。首先，对样品进行冷变形；然后，对不同变形量的样品进行退火处理。利用光学显微镜和扫描电镜以不同尺度对样品进行组织观察，通过X射线衍射、磁性测量进行组成相分析，利用维式硬度和单向拉伸试验对样品进行力学性能测试。结果表明：冷变形量为90%时，钢中应变诱导马氏体含量接近71.72%，硬度由原始试样的193.10 Hv增加到475.77 Hv；在820~870 ℃保温60 s，退火后可以获得微米/纳米复合结构组织，其中850 ℃退火后的样品其逆转变奥氏体组织的百分含量为100%，粒径≤500 nm的晶粒占29.6%，粒径>0.5 μm的约占70.4%，其抗拉强度可达959.24 MPa，延伸率为44.6%，强塑性结合好于原始试样。

关键词： 奥氏体不锈钢 应变诱导马氏体 逆转变 晶粒细化

Structure control of micrometer/nanometer scale reverse transformation austenite

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Abstract: To control the micrometer/nanometer scale reverse transformation austenite structure, the effects of cold deformation and annealing parameters on the microstructural development and mechanical properties of the 316 L austenite were investigated. First, the cold deformation was performed for the specimens, and then the specimens with different deformations were annealed. The microstructural evolutions of the specimens were analyzed by using a optical microscope and a scanning electron microscopy, the composed phases of the specimens were researched by a magnetic measurement and X-ray diffraction and their mechanical properties were determined by Vickers hardness method and tensile tests. The results show that the stain-induced martensite is almost 71.72% at 90% cold deformation, and the hardness value increases from 193.10 Hv to 475.77 Hv. The resultant micrometer/nanometer grained steel can be obtained after annealing at 820-870 ℃ for 60 s and austenite grains with a size greater than 0.5 μm (70.4%)and less than 500 nm(29.6%) can be obtained after annealing at 850 ℃ for 60 s. Moreover, the specimens are completely reversed to austenite (100%). The resultant micrometer/nanometer grained steel not only exhibits a high strength level about 959.24 MPa, but also a desirable elongation of about 44.6%.

Keywords: Austennitic stainless steel Strain-induced martensite Reversion Grain refinement

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