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研究论文

18.8\%MnTRIP/TWIP钢的拉伸应变硬化行为

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摘要：

对锰含量为18.8%的TRIP/TWIP钢进行单轴拉伸实验, 研究了这种钢的应变硬化行为. 结果表明: 这种高锰TRIP/TWIP钢的真应力应变曲线不完全遵循Hollomon的线性关系, 在不同变形阶段强化机制不同. 在塑性变形的开始阶段TRIP效应比较明显, 且应变硬化指数n是恒定的; 而真应变在0.14--0.35之间时二阶导数$d^2\sigma/d\varepsilon^2>0$, 应变硬化指数$n$随着应变量的增加而增加, 其微观机制是形成大量的形变孪晶, 并有孪晶和位错的交互作用, TWIP效应在该阶段占主导作用. 真应变大于0.35后有少量TRIP效应, 此时两相均发生变形.

关键词： 金属材料 高锰钢 TRIP/TWIP效应 应变硬化 力学性能

Tensile strain hardening behavior of TRIP/TWIP steel with 18.8% manganese

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Abstract:

The tensile tests were carried out to study the strain hardening behavior of a high manganese TRIP/TWIP steels with 18.8% manganese. The results indicated that, strain hardening behaviors are different during the deformation process. True stress-strain curve obeys Hollomon relationship partly. TRIP effect occurs in the initial plastic stage, and the strain hardening exponent in this stage is a constant. However, the value of n increases with true strain ε increasing, when true strain is between 0.14 and 0.35. Then the value of d2σ/dε2 is above zero. A lot of deformation twinning can be found, and the micro mechanisms are twins induced plasticity . TWIP effect dominates this stage. The mechanism of the last stage is some TRIP effect, and both phases have occurred plastic deformation.

Keywords: metallic materials high manganese steel TRIP/TWIP effect strain hardening mechanical properties

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