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γ-TiAl合金全片层组织室温变形协调行为

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摘 要：研究Ti-47.5Al-2Cr-2Nb-0.2B全片层组织室温变形结构中γ/γ片层间变形协调行为。引入多晶体塑性变形的几何协调因子*m*，并利用矩阵分析方法计算120°旋转有序型、真孪晶型和伪孪晶型γ/γ界面两侧片层中各种滑移系之间的*m*值，与实验结果比较发现，通过计算*m*值可以预测不同类型γ/γ界面两侧片层中的有效滑移系，120°旋转有序型γ/γ界面几何协调性最好，1/6 {112]{111}形变孪晶可以通过1/2{110]{111}普通位错协调变形；对于真孪晶型界面，1/6{112]{111}形变孪晶可以扩展通过，并仍以1/6{112]{111}孪晶变形进行协调。

关键字： TiAl合金；片层组织；变形协调；孪晶；位错；晶体位向

Compatibility of deformation in fully lamellar microstructure of γ -TiAl alloy at ambient temperature

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Abstract: The compatibility of deformation in fully lamellar microstructure of Ti-47.5Al-2Cr-2Nb-0.2B alloy at room temperature was studied. A geometric compatibility factor m was calculated by matrix operation to compare the compatibility between two slip systems in two neighboring γ lamellae with 120°-rotational, true-twin and pseudo-twin relationships. The experimental results show that the effective slip systems between two neighboring γ lamellae can be predicted by calculation of the m values. Among the three type γ/γ interfaces, the compatibility between 120°-rotational ordered interface is the best, the deformation of 1/6 {111} twinning in one γ lamella can transfer into another γ lamella by 1/2 {111} ordinary dislocation slip. For true-twin interface, 1/6 {111} twin can propagate into a neighboring γ lamella through 1/6 {111} twinning.

Key words: TiAl alloy; fully lamellar microstructure; deformation compatibility; twin; dislocation; crystal orientation

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