



## 论文摘要

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### 不同应力下7B04铝合金的疲劳断口

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**摘要:** 采用金相、电镜扫描显微技术对不同应力下铝合金的疲劳断口显微组织进行分析和对比研究, 揭示该合金疲劳裂纹萌生与扩展的微观特征。研究表明: 疲劳裂纹一般在材料表面或近表面处萌生, 与表面的距离随加载应力升高而减小, 在应力为285 MPa时裂纹于距表面约250  $\mu\text{m}$ 处萌生, 而在430 MPa时裂纹萌生于材料表面; 在裂纹源附近观察不到疲劳辉纹, 且加载应力越高, 这个区域的面积就越小, 而裂纹扩展区的疲劳辉纹间距随应力的增大而增大; 裂纹形成后, 微裂纹沿着与应力轴呈45°角的最大切应力方向向纵深扩展, 然后转向与拉应力轴正交的方向扩展, 最后瞬断, 且随着应力的增大, 断口上疲劳裂纹扩展区的面积减小, 瞬断区的面积增大。

**关键词:** 铝合金; 疲劳断口; 裂纹萌生; 裂纹扩展; 疲劳辉纹

### Fatigue fracture of 7B04 aluminum alloy under different stresses

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**Abstract:** The microstructures of fatigue fracture of Al alloys under various stresses were studied by optical microscope and scanning electron microscope, and the microscopic features of crack initiation and propagation in this kind of alloy were revealed. The results show that the fatigue cracks usually initiate at or near the free surfaces of the specimen. And with the increase of the loading stress, the distance between the crack and the surface decreases. The cracks are 250  $\mu\text{m}$  in depth from the surface under strain of 285 MPa, while they are initiated at the free surface under 430 MPa. Striation can't be observed in the area near the crack source. Moreover, the area will be reduced with the increase of loading stress. In the crack propagation zone, there is a uniform increase in striation distance as the strain amplitude increases. After the formation of cracks, the micro cracks propagate towards the depth along the direction of maximum shear stress at an angle of 45° with the stress axis, and then they turn to the direction perpendicular to the stress axis and finally get fractured instantaneously. With the increase of stress, the area of propagation zone on the fracture surface reduces while the area of fatigue fracture zone is enlarged.

**Key words:** Al alloy; fatigue fracture; crack initiation; crack propagation; fatigue striation

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