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高温不锈钢与钛合金微动疲劳特性的实验研究

戴振东, 朱如鹏, 潘升材, 王珉

南京航空航天大学机电学院, 江苏南京 210016

EXPERIMENTAL STUDIES ON FRETTING FATIGUE OF STAINLESS STEEL AND TITANIUM ALLOY

DAI Zhen-dong, ZHU Ru-peng, PAN Shen-cai, WAMG Min

Department of Mechanical Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China

摘要 用桥式试样研究了接触压力、微动幅度、温度、循环次数、高低周载荷幅值比等参数对微动疲劳寿命影响。结果表明拉应力和法向压力均影响微动疲劳寿命。当拉应力较大时，微动疲劳寿命（ＰＦＬ）与普通疲劳寿命（ＰＦＬ）相差不大，法向压力的影响不明显；拉应力较小时，ＦＦＬ显著低于ＰＦＬ，且法向影响显著。ＦＦＬ随法向压力增加而降低，但当超过２００ＭＰａ后，反而提高。高低周幅值比的增加，ＦＦＬ大幅度降低。当幅值比为０．１２５，从室温到４５０℃，ＰＦＬ持续降低。而ＦＦＬ从室温到２００℃降低幅度较大，在３００℃左右恢复，随后又降低。研究表明ＦＦＬ的恢复是微动表面形成了防护性釉质层的结果。

关键词： 微动疲劳 复合载荷 不锈钢 钛合金

Abstract: The effects of contact pressure, amplitudes, applied loads, temperature, number of cycles and the ratio of high cycle load to low cycle one on fretting fatigue life and frictional coefficient were carried out. The test results indicate that both the tensile stress and the contact pressure affect the FFL. The difference between the PFL and FFL is not obvious for large tensile stresses and so does the effect of the contact pressure on the FFL. For small tensile stresses FFL is reduced greatly and the contact pressure affects the FFL heavily; it is reduced first with the increase of contact pressure at low contact pressure, but increases when the latter is greater than 200Mpa because of the decrease of amplitude. With the increase of temperature the FFL decreases from room temperature to 200℃, increases at about 300℃, and decreases again. The SEM studies reveal that it is flake like oxide that protects the contact surface from further damage and results in an enhancement of FFL.

Keywords: fret t ing fat igue comp lex load stainless steel t itanium alloy

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