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渗碳钢在接触疲劳过程中表面层的残余应力

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THE RESIDUAL STRESS ON SURFACE LAYER OF CARBURIZED STEEL DURING CONTACT FATIGUE

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摘要

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摘要 对18Cr2Ni4WA钢表面渗碳层内的残余应力在接触疲劳过程的变化进行了跟踪。钢经930℃ 4h渗碳,850℃二次淬火,170℃ 2h回火,磨削加工后,表面硬度HRC 55~57,直径60mm的滚子试样转速1470r/min,滑差-5%,30号机油润滑,油温35~45℃,最大接触应力2668MPa,不同循环周次后用x射线应力分析仪测定残余应力沿表面层的分布,用x射线衍射仪测定残余奥氏体。结果表明,渗碳硬化处理后,在表面层所形成的残余压力在整个接触疲劳过程中变化不大,残余奥氏体转变、马氏体分解也很少。高的组织稳定性是残余应力稳定的主要原因。

关键词: 接触疲劳 渗碳 残余应力

Abstract: The change of residual stress in surface layer of case-hardened 18Cr2Ni4WA steel during rolling contact fatigue is studied. Carburizing was carried out at 930℃ 4h, and then double quenching at 850℃ and tempering at 170℃ 2h were made. The hardness of case has HRC = 55 - 57 after grinding. The test condition was follows: the maximum hertzian stress was 2668MPa, rotational speed was 1470 r / min, lubrication was made using grade 30 machine oil, and the ratio of slide to roll was -5%. The stress was determined by x-ray analyzer after 0、104、105、106、107 cycle individually, and the residual austenite was determined by x-ray diffractometer. The results show that case-hardening treatment leads to compressive residual stress on surface layer of specimens. The change of residual stress in surface layer of specimens during the contact fatigue is limited and located within a definite zone. The transformation of residual austenite and decomposition of martensite are negligible. The high structural stability of the carburized layer of 18Cr2Ni4WA is the main cause of the stability of residual stresses, which can be referred to for design.

Keywords: contact fatigue carburizing residual stress

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