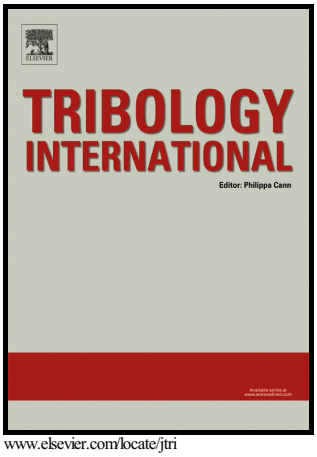

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MICRO-ABRASIVE WEAR MECHANISMS OF BORIDED AISI 1020 STEEL

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Abstract

A boriding treatment was applied to AISI 1020 steel at 1000 °C for 4 hours. The samples were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM) and the Knoop microhardness test. The loads and abrasive slurry concentrations used in the micro-abrasion tests (fixed-ball) were 0.49–0.98 N and 0.5–1.0 g/cm³, respectively. Silicon carbide (SiC) abrasive powders (5 μm) were used in the abrasion experiments. The wear coefficient and mechanisms were compared with those obtained from untreated samples. The XRD analysis revealed the presence of the Fe_2B phase on the borided samples. The iron borided layer was 177 μm thick and had a hardness of 2100 $HK_{0.01}$. The wear mechanism for the borided samples was rolling abrasion while grooving abrasion with micro-rolling occurred in the untreated samples.

Keywords: Micro-scale abrasion; Tribological behavior; Boriding, AISI 1020 steel

1. Introduction

Surface treatments are an important method used to improve the tribological properties, oxidation and corrosion resistance of engineering materials subjected to aggressive environments and strong wear conditions, which need surfaces with a high

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