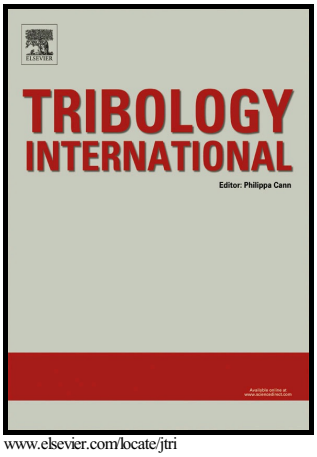

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A Novel Laser Surface Compositing by Selective Laser Quenching to Enhance Railway Service Life

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Abstract

With the rapid development of high-speed and heavy-haul trains, it is challenging to improve the service life of rails. In order to ensure toughness and contact fatigue resistance (CFR) of rails, the present technical standards restrict the hardness of rails to be beneath HB400 and forbid the martensite structure in rails. In this study, a novel laser surface compositing (LSC) based on selective laser quenching is proposed to strengthen the rails. By designing the hardening area sizes and proportions rationally, the wear resistance of the rails is enhanced by 2.2-3.5 times without noticeably deteriorating their contact fatigue resistance (CFR). Furthermore, the wear and contact fatigue behaviours of the LSC rails were investigated systematically.

Keywords: Laser surface compositing (LSC); Selective laser quenching; Wear resistance; Contact fatigue resistance (CFR).

1. Introduction

With the rapid development of high-speed and heavy-haul trains all over the world, the short service life of rails, especially for some key parts of the railways, has become a serious challenge. This affects the safety and transportation capacity of trains significantly.