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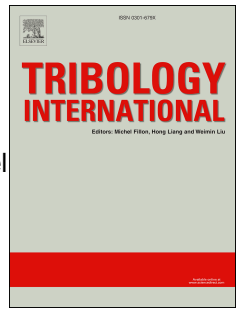

Wear behavior and the corresponding work hardening characteristics of Hadfield steel

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Wear behavior and the corresponding work hardening characteristics of Hadfield steel

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Abstract: The wear properties of N+Cr alloyed Hadfield steel (i.e., Mn12CrN steel) and traditional Hadfield steel (i.e., Mn12 steel) were studied. Results showed that the wear behavior and work hardening characteristics of Mn12CrN steel were different from those of Mn12 steel under different wear loads. Mn12CrN steel presented common wear resistance under low wear loads, but strong wear resistance under high wear loads. The worn surface hardness of Mn12CrN steel increased slowly under low applied wear loads, but increased rapidly and approached the saturation value under high wear loads. The effect of N and Cr combination alloying on initial strength and twinning behavior was responsible for the different hardening characteristics of Mn12CrN steel.

Key words: Dry wear; Hadfield steel; N+Cr alloying; Work hardening; Wear resistance

1. Introduction

Wear damage is one of the most common failure modes of mechanical components in service. Wear is a slow process that has long existed in construction machinery operations. [1-4]. Wear between metal materials reduces the accuracy of machine parts, resulting in an abnormal operation of machines and even serious accidents. Therefore, improving the wear resistance of metal materials is important to ensure the safety of machines and to save natural resources.

Hadfield steel (Fe-12Mn-1.2C) possesses high work hardening capacity and high impact toughness [5-8]. Its special material characteristics lead to different wear behavior compared with other wear-resistant materials. However, alloying or pre-processing treatment influences the wear behavior of Hadfield steel. Abbasi et al. [9] studied the abrasive wear behavior of Hadfield steel alloyed with or without Al at different stress conditions. At low stress condition, the wear resistance

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