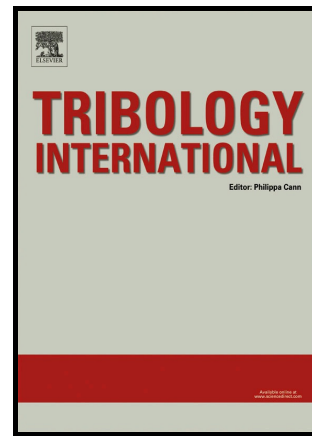


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Effects of nano-SiO₂ as water-based lubricant additive on surface qualities of strips after hot rolling

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Abstract:

Hot rolling experiments were carried out to study the effect of nano-SiO₂ on surface qualities including topography, microstructure and oxide scale of rolled strips. Results show that the surface topography becomes smooth with the addition of nanoparticles into base lubricant when the concentration of nano-SiO₂ is less than 0.5 wt.%. Thickness of oxide scale is decreased from 15 μm to 8 μm and the grain size of microstructure on surface is refined simultaneously. Surface qualities are improved due to the better lubrication performances, which are related to the functions of micro-rolling, polishing and self-repairing of nano-SiO₂ on strip surface.

Keywords:

SiO₂ nanoparticle; Topography; Lubrication; Rolling.

1. Introduction

With the development of nano-lubricating technology and the deepening understanding of particularity of functional nano-materials, nanoparticles used as additives show unique physical and chemical properties and have a broad application prospect in lubrication. Nanoparticles as lubricant additives such as Cu [1], TiO₂ [2, 3], Cu/SiO₂ [4], SiO₂ [5-8], Al₂O₃ [9], ZnS [10] and MoS₂ [6, 11, 12] possess outstanding extreme pressure performances, excellent anti-wear properties and good lubricating performances. Padgurskas J et al. [1] studied the tribological properties of Fe, Cu and Co nanoparticles, experiment results showed that the friction coefficients and wear of friction pairs significantly reduced with addition of nanoparticles. Some

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