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Effect of composition and heat treatment strategy on corrosion and tribo-corrosion properties of high-speed steels

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The aim of our study was to evaluate the tribo-corrosion properties of different grades of high-speed steels subjected to different heat treatment strategies. Conventionally heat-treated steel grades were compared to un-conventionally treated comprising cryogenic treatment cycle in order to investigate the effect of chemical composition, microstructure and hardness of the material on tribocorrosion properties.
Microstructural properties were first determined through observation of the metallographically prepared steels using scanning electron microscopy. The hardness of steels was also measured. These studies were complemented by an investigation into corrosion via different electrochemical techniques: corrosion potential measurement and linear polarization measurement of steels in a sodium tetraborate buffer at pH 10. Tribocorrosion properties were studied in the same solution using reciprocating sliding in order to study the effect of microstructure, hardness and passive properties of different grades of high-speed steels.
This study investigates the impact of heat treatment strategy on microstructure and the resulting hardness of the steels, which varies with their chemical composition. Corrosion studies will explore methods to differentiate the corrosion properties of the steels following different heat treatment strategies and cycles. Additionally, tribocorrosion properties will be evaluated using various approaches to assess steel grades subjected to different heat treatment strategies, with varying carbon and chromium content which further affect passive properties. The aim is to identify an optimal test procedure that reliably identifies the key properties of steels studying tribocorrosion performance.

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