

Session: Exploring coating materials based on the Cr-B-N system for the corrosion-wear protection of stainless steels
F3

Abstract #
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Abstract: (SUPPLEMENTAL DOCUMENT was submitted with the abstract)

The corrosion-wear material loss of metallic surfaces is a serious concern in many application sectors, ranging from bio-medical implants to marine, oil and gas field components to transport vehicle and nuclear reactor devices. To date little effort has focused on developing specific coating materials to combat corrosive-wear processes. The present paper explores the viability of using Cr-B-N based coatings and reports their performance when applied to a grade of super austenitic stainless steel and subjected to reciprocation sliding contact tests (against aluminium oxide) in an aqueous 0.9%NaCl solution under a normal force of 1N. (Super austenitic stainless steels are widely used in the oil & gas sector as well as in the nuclear and bio-medical device industries) The electrode potential and corrosion current was monitored (where possible) throughout the tests. Whilst in principle the formation of low friction layers based on BN was considered probable, in practice this did not happen, instead relatively high friction layers were produced. On the whole, increasing the N content of the coatings caused a deterioration in hardness and corrosion-wear resistance. In fact the best corrosion-wear protection was offered by Cr-B coatings containing no additions of N. The same coatings have also shown useful performance for the protection of ferritic stainless steel internal combustion engine piston rings in elevated temperature (circa 190°C) high speed organic fluid lubricated reciprocation sliding contact tests.