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EROSION AND CORROSION RESISTANCE OF A PRECIPITATION HARDENING STAINLESS STEEL WITH A DUPLEX CVD COATING

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Duplex coatings are a combination of two plasma assisted surface treatments as a way to obtain good combined properties such as high hardness and good mechanical stability. Plasma nitriding has proven to be a way to increase hardness and wear resistance in steels, but not always corrosion resistance is conserved after nitriding. A top coating can be the solution to pitting corrosion and wear behaviour can be improved with the nitrided layer as a mechanical support.
Results of erosion and corrosion behaviour ofthe PH stainless steel Corrax® treated with the combination of dc pulsed ion nitriding with a SiNx CVD coating are presented, comparing with a single coating over the same steel and a nitrided sample without coating.Structure and surface composition were analyzed by Raman Spectroscopy, optical microscopy, SEM and EDS. Wear and corrosion behaviour were evaluated in a slurry erosion/corrosion situation. Corrosion resistance was further evaluated by salt spray fog test and cyclic potentiodynamic polarization in 0.6 M NaCl solution.
The coated and duplex treated samples showed no corrosion attack in the salt spray fog test, opposite to the nitrided sample, which showed a small percent of general corrosion and a few pits. In the experiments of erosion/corrosion the duplex treated samples showed the best behaviour, and in the single coated ones, the thin film was totally removed. All treated samples showed, like the original material, a passive behaviour in the potentiodynamic tests, but with different corrosion and attack potentials. Coated samples had the best corrosion behaviour but pitting couldn't be avoided and started in film pores. Nevertheless, it was observed that the corrosion propagation mechanism was retarded in the SiNx coated samples comparing to the nitrided and non nitrided samples.

Keywords
plasma nitriding
cvd films
corrosion resistance
erosion
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