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INFLUENCE OF THE NITRIDED LAYER AS PRE-TREATMENT ON ADHESION, WEAR AND CORROSION RESISTANCE OF DLC COATINGS DEPOSITED ON STAINLESS STEELS

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Surface engineering of stainless steels improved the tribological performance of these steels, mainly using plasma assisted diffusion processes such as ion nitriding. In the last years also different coatings appeared, especially DLC films targeting biomedical applications, as well as in others industries (O&G, plastic, and food and beverage). DLC films have outstanding properties such as chemical inertia and low friction, but adhesion, corrosion and wear behavior are heavily dependent on the interlayer with stainless steel. Usually an amorphous silicon layer is deposited before the DLC but it was demonstrated that nitriding could also be a strong interphase, solving many problems in aggressive environments or with severe mechanical solicitations.

In this work, a review of the last results obtained by the authors regarding wear and corrosion, with different nitrided layers on AISI 316L and AISI 420, and different DLCs (hard and soft), is presented.

The influence of surface finishing, composition and width of the nitrided phase are discussed in relation to adhesion strength, using results from Rockwell C indentation and Scratch techniques. The results of sliding wear experiments and corrosion tests are also presented. The determining role of the DLC defects and the benefits of a nitrided layer are discussed. Moreover, the combination between the Si layer and the nitride layer seems to be beneficial for adhesion as well.

Keywords

nitriding
stainless steel
duplex treatment
DLC
adhesion