

Mechanical and corrosion behaviour of DLC and TiN coatings deposited on martensitic stainless steel

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The ceramic and carbon coatings such as TiN and DLC coatings (Diamond Like Carbon) are characterized by good mechanical properties and chemical inertia. These coatings can be used in order to improve stainless-steel surface properties. The objective of this work is to compare the wear, friction, adhesion and corrosion behaviour of commercial TiN and DLC coatings deposited on AISI 420 stainless steel. The TiN coatings were prepared by PAPVD in an industrial reactor while the DLC coatings were deposited by PACVD method in an experimental reactor. The microstructure of the coatings was characterized by OM, SEM and XRD. The Hardness and Young's Modulus (E) were measured by nanoindentation. The corrosion behaviour was evaluated by Salt Spray Fog and electrochemical tests in NaCl solution. Pin on disk and abrasive wear tests were performed. Adhesion was evaluated by means of Scratch Test and Rockwell C Indentation. The thickness for both coatings was between 1 and 1.5 μm . The hardness and E were 26 GPa and 163 GPa for the DLC coating, meanwhile it was 34 GPa and 328 GPa for the TiN coating. The results show that the TiN coatings presented better abrasive wear resistance than the DLC coatings; however, the latter was more resistant in the pin on disk test and it had a lower friction coefficient. Both coatings showed far better wear resistance than the untreated steel. Regarding the corrosion behaviour, both coatings exhibited acceptable corrosion resistance in the Salt Spray Fog Test. DLC coatings had both nobler corrosion potential and breakdown potential than the TiN coatings in electrochemical tests. Finally, TiN coatings had a better adhesion to the substrate than DLC coatings, proved in both tests.