

DLC multilayers to improve fretting and corrosion resistance over nitrided martensitic stainless steel

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Martensitic stainless steels have different applications in industry where good corrosion and wear resistance are required. Moreover, in some applications, the fretting wear is one of the mechanisms responsible for the component degradation. DLC coatings can be used in order to improve the surface properties but sometimes a monolayer coating is not enough so several layers are necessary.

In this work, the fretting wear and corrosion behavior of DLC multilayers coatings were studied and compared to the monolayer coating. Both were deposited by PACVD (Plasma Assisted Chemical Vapour Deposition) on nitrided and non-nitrided martensitic stainless steels.

The coatings were characterized by Raman Spectroscopy, SEM, and OM. Fretting wear tests were carried out using different loads. Electrochemical tests were performed in NaCl solution. The adhesion was evaluated by scratch tests both with variable and constant load and also by Rockwell C Indentation

The fretting wear resistance was better for multilayers than for monolayers, which in turn increased when the substrate was nitrided. The monolayer corrosion behavior was not as good as multilayers. Although both coatings presented defects, probably the presence of different layers makes it difficult for one of the defects that is in one layer to continue in the next one. In this way, the corrosive solution cannot reach the substrate and thus preventing the corrosion phenomenon from developing.

Monolayer adhesion was similar to that of multilayers when evaluated by both tests. Only the previous nitriding treatment improved the adhesion in both cases.

Keywords

multilayers
DLC coating
PACVD
corrosion
fretting