

DEPENDENCE OF Si-CONTAINING INTERLAYERS' DEPOSITION TIME ON ADHESION OF DLC THIN FILMS ON SAE 4140 STEEL

Jennifer Stefani Weber¹, Vanessa Piroli¹, Michael Cristian Goldbeck¹, Bruna Louise Perotti², Carla Daniela Boeira¹, Newton Kiyoshi Fukumasu³, Alexandre Fassini Michels¹, Carlos Alejandro Figueroa¹

¹Universidade de Caxias do Sul, ²Universidade de Caxias do Sul (PPGMAT) , ³Universidade de São Paulo

e-mail: jsweber@ucs.br

Diamond-like carbon (DLC) is an amorphous material widely used in coatings due to its applied properties in technological issues, such as high hardness, wear resistance, chemical inertness and low coefficient of friction [1]. However, the low adhesion in metallic alloys, due to high compressive stress and low interfacial density of effective bonds, is a major setback in the coating's application. One possible solution is the application of non-metallic interlayers [2]. In this context, the aim of this work is to investigate the adhesion of DLC films on steel through the use of silicon-containing interlayers by varying the deposition time. The interlayers and their influence on the physicochemical properties of the system were evaluated through FEG-SEM, EDS, GDOES, FTIR, roughness and scratch test. The results showed the presence of three distinct regions in the FEG-SEM cross-section analysis: a-C:H film, a-SiC_x:H interlayer and the ferrous alloy. A gradual increase in silicon contribution was observed as a function of the deposition time in addition to an increasing trend in defect density and surface defect ratio. Good enough adhesion was observed in times equal to or greater than 5 min of deposition, but no significant variation was identified in the critical loads of these coatings.

[1] DONNET, C.; ERDEMIR, A. **Tribology of diamond-like carbon films: Fundamentals and Applications**. Springer, 2008.

[2] CEMIN, Felipe *et al.* The influence of different silicon adhesion interlayers on the tribological behavior of DLC thin films deposited on steel by EC-PECVD. **Surface & Coatings Technology**, Caxias do Sul, v. 283, p. 115-121, out. 2015.