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***** INVITED LECTURE *****

The Actual Approach for Atmospheric Corrosivity Clasiffication in Respect to Protective Coating Choice ***D1***

The system of atmospheric corrosivity classification was specified by ISO EN 9223 and this system is implemented into other standards for protective coating choice (paint coating, metalic coating, duplex system, etc.). The corrosivity category is also important for accelerated testing of choosen protective systems - duration of test. Due to changing and varying environmental situation in Europe the actual data is necessary to use the suitable values. The specific microclimates are presented too.

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Effect of Laser Boronizing on Microstructure and Hardness of Maraging Steel Parts Manufactured by Selective Laser Melting ***D2***

In the present study, surface laser boronizing technique was applied to improve wear resistance of maraging steel (MSt) parts manufactured by selective laser melting (SLM). Samples for investigation were manufactured of DIN 1.2709 steel powder using Concept Laser M3 equipment. Continuous 1 kW CO2 laser was applied at 0.5-4.0 mm laser spot and 250-1500 mm/min laser operating speed, providing power density between 796 and 50955 W•cm-2 and heat input between 4.0 and 24.0 J•mm^{-1}, respectively. Before laser-processing, amorphous boron paste was preplaced on samples surface. The appropriate melt pool geometry was applied at 0.5 mm laser spot, for which XPS analysis revealed increase in boron concentrations from ~3.1 to ~5.7 wt. % with laser speed increase from 500 to 1500 mm/min. XRD analysis revealed domination of Fe3B type borides along with presence of FeB, Fe2B type borides and presence of reflections attributable to austenitic and martensitic phases. The microstructure of laser-boronized layers exhibits evolution from fine dendritic boride-based eutectic plus Fe-based solid solution microstructure having ~630-780 HK0.5 hardness (at 500 and 750 mm/min laser speed) to superfine lamellar nanoeutectic (at 1000 and 1250 mm/min; ~1000-1030 HK0.2) and further to submicron-sized grain boride structure (at 1500 mm/min; ~1770 HK0.2). The obtained hardness is up to three times higher than that of MSt after aging (~600 HK), indicating that laser boronizing technique may be promising in term of the improve of MSt wear resistance.

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Influence of Plasma-Nitriding on the Adhesion of PACVD-DLC Films ***D3***

DLC films have special properties, which are of great interest in fields of tribology, including the high hardness and the low coefficient of friction. These properties are limited because of shortcomings in adhesion of DLC films on steel. So far, metallic adhesive layers like titanium and chromium are established options for the improvement of the adhesion of DLC films on steel. However, it is hardly investigated how plasma nitrided surfaces increase the adhesion by itself. Starting point for this research were the different surface modifications, which can occur through plasma nitriding. The surface can consist of a compound layer of γ '-nitride and/or ε-nitride or it is also possible that there is no compound layer. These surface modifications differ in their composition, crystal structure, bond type, as well as their solubility and diffusion velocity of carbon. By means of a two-stage nitriding process, it was ensured that the hardness depth profile of all three surface modifications were similar. Thus, the "eggshell" effect should have no significant influence on the research. Afterwards, the nitrided specimens were DLC coated by PACVD. Tests, executed on a scratch test rig, indicate that plasma nitriding can improve the adhesion of DLC films. LC2 values of up to 60 N could be achieved. Typical values of LC2 DLC films with metallic adhesive layers are about 25 N. During the investigations, it also became apparent that adhesion in this system is influenced by other factors, such as environmental conditions and polishing processes.

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