V2023
International Conference & Exhibition
INTERNATIONAL CONGRESS CENTER DRESDEN
SEPTEMBER 18 – 21, 2023
© mediaserver.dresden

Thin Films and Surface Treatment for
Energy · Biomedical Application · Optics · Tools & Components

2023 VACUUM PLASMA SURFACE COATING

EFDS

Poster-Session

Resource-Efficient Plasma Nitriding of Stainless Steels for Combined Tribological and Corrosive Stresses

M.Sc. Hoang Minh Vu[1], M.Sc. Phillip Reinders[2], Dr.-Ing. Holger Hoche[1], Dipl.-Ing. Peter Kaestner[2], Prof. Dr.-Ing. Matthias Oechsner[1], Prof. Dr. rer. nat. Günter Bräuer[2]

[1]*Technical University Darmstadt, Darmstadt, Germany;* [2]*Technical University Braunschweig, Braunschweig, Germany*

hoang_minh.vu@tu-darmstadt.de

Plasma nitriding of stainless austenitic steels increases wear resistance through the formation of the so-called S-phase. Unfortunately, thickness of this wear-resistant S-phase and the corrosion behavior is counter-rotating dependent on process parameters (cf. Fig. 1) as well as material and material state, e.g. deformation induced martensite due to cold forming (cf. Fig. 2 and Fig. 3).

The aim of RePlaNiro is therefore to determine process parameters for the plasma nitriding treatment of austenitic steels that are individually optimized for material and material state. This enables the prediction of nitriding results as a function of the above-mentioned factors. For example, this is displayed in Fig. 4 for nitriding depth in solution-annealed austenitic steel 1.4307.
In RePlaNiro, the model is extended by the factors microstructure and surface condition. Furthermore the corrosion behavior is investigated. This enables reproducible plasma nitriding processes for SMEs.

Fig. 1: schematic Relation between corrosion behavior, wear resistance and temperature

Fig. 2: material state with different degree of deformation 0%, 20 %, 40 %

Fig. 3: Influence of degree of deformation on diffusion depth and corrosion resistance for austenitic. steel 1.4307

Fig. 4: Lines of equal S-phase thickness as a function of temperature and treatment time for austenitic steel 1.4307