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Lecture

Corrosion and wear properties of plasma nitrided 316L stainless steel

Thursday (27.09.2018)
11:30 - 11:45 **S1/01 - A02 (/index.php?id=5980&L=0&tx_dgmprogram_fullprogram%5Broom%5D=118&tx_dgmprogram_fullprogram%5Baction%5D=show&tx_dgmprogram_fullprogram%5Bcontroller**

Part of:

Z01.2: Session Z02 - Ch. R. Arce and F. Soldera Session
Thursday (27.09.2018)
11:15 - 12:45

Austenitic stainless steels are used as key material in many industries such as food, chemical and oil-gas among others. This choice is due to their excellent corrosion resistance. Nevertheless, their poor tribological properties limit their use in many applications in which their corrosion behavior is looked for.

During last few decades, surface engineering has been growing in the field of plasma assisted techniques for hardening materials. Plasma nitriding of austenitic stainless steel yields surface hardening without producing sensitization, because it is a relatively low temperature diffusion technique.

Since 2010, in the frame of the European SUMA2 project and the binational project, the University of Saarland (Saarbrucken, Germany), the Leibniz Institute (Leipzig, Germany), INTEMA (Mar del Plata, Argentina) and the UTN-FRCU (Concepción del Uruguay, Argentina) have worked in collaboration to developed and characterize the successful nitriding of austenitic stainless steels by different plasma assisted techniques such as Plasma Immersion Ion Implantation (PI3), DC Pulsed Plasma Nitriding and Low Energy Ion Implantation (LEII)

XRD have been performed in order to characterize the structure of the surface layers. The nitriding process produces a shift of the gamma peak of the austenite to lower angles. This is attributed to a lattice expansion and distortion. Additionally, ToF SIMS evidenced a high concentration of nitrogen in the nitride layer.

The corrosion behavior was evaluated by means of anodic polarization curves, making a sweep in potential from open circuit potential to a breakdown potential, arbitrary chosen as the potential in which the current density reach 200 microA/cm2 (to assure the damage is enough to be detected and not too much to completely destroy the surface). Optical and electronic microscopy was used to characterize the attack morphology. Additionally, cross sections made by ion milling, using a FIB facility, evidenced the influence of the nonmetallic inclusions in the corrosion process of the nitrided steels.

Tribology and wear tests have been also carried out to determine the mechanical behavior of the different nitrided layers. Wear loss was determined and wear mechanisms are being discussed in relation to hardness and microstructure.

Speaker:

Prof. Dr. Sonia Brühl (https://2018.mse-congress.de/index.php?id=3045&L=0&tx_management_profile%5Bpk%5D=l4a3ld1buifg22hCoPe&tx_management_profile%5Baction%5D=index&tx_management_profile%5Bcontroller%5D=Pro
Universidad Tecnológica Nacional - UTN

Additional Authors:

- Prof. Dr. Silvia Simison
  INTEMA (Institute of Research in Materials Science and Technology) / Universidad Nacional de Mar del Plata UNMdP
- Dr. Lisandro Escalada
  INTEMA (Institute of Research in Materials Science and Technology) / Universidad Nacional de Mar del Plata UNMdP
- Dr. Darina Manova
  Leibniz Institute of Surface Engineering (IOM)
- Dr. Stephan Maendl
  Leibniz Institute of Surface Engineering (IOM)
- Laura Vaca
  Universidad Tecnológica Nacional - UTN
- Dr. Flavio Soldera
  Saarland University
- Dr. M. Agustina Guitar
  Saarland University

Symposium

● **Z01: Argentinean-German Collaboration in Materials Science and Engineering (/index.php?id=5980&L=0&tx_dgmprogram_fullprogram%5Bcategory%5D=1922&tx_dgmprogram_fullprogram%5Baction%5D=singleview&tx_dgmprogram_fullprogram%5**

Z01.1: Session Z01 - Ch. S. P. Brühl and A. R. Boccaccini Session
Thursday (27.09.2018)
09:15 - 10:45 (/index.php?id=5980&L=0&tx_dgmprogram_fullprogram%5Bcategory%5D=2210&tx_dgmprogram_fullprogram%5Baction%5D=singleview&tx_dgmprogram_fullprogram%5Bcontroller%5D=Category&cHash=

Z01.2: Session Z02 - Ch. R. Arce and F. Soldera Session
Thursday (27.09.2018)
11:15 - 12:45 (/index.php?id=5980&L=0&tx_dgmprogram_fullprogram%5Bcategory%5D=2211&tx_dgmprogram_fullprogram%5Baction%5D=singleview&tx_dgmprogram_fullprogram%5Bcontroller%5D=Category&cHash=