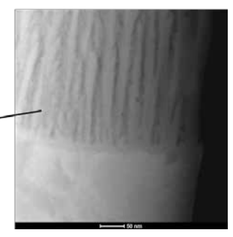
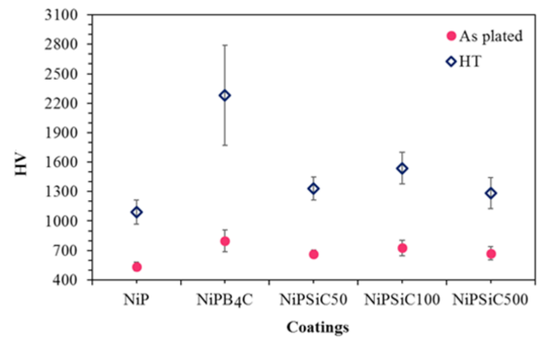
Surface treatments for cast components

the experience from projects Rheocal and PROCETS

SUMMARY

Surface coatings is commonly needed for those components where the surface is exposed to the environment or to friction and wear. In case of cast component some hinders for high quality treatments are present that can limit the added value of the final product.
At JTH, research is focusing on specific coating processes for cast materials.
Anodizing is a cost effective and simple surface treatment, which is common on Al and its alloys. The anodising generates a hard oxide layer which provides a protective barrier to the harsh environment applications where high corrosion resistance and /or abrasion resistance.
Electroplating of cast components is a common process to give to the components surface wear resistance and corrosion protection. With the new EU restrictions on use of Cr plating, new wear resistant coatings need to be developed and up-scaled and composite coatings are a very good candidate to obtained high performant surfaces.
First results show how microstructure and surface process parameters are of great influence on the final component performance. Component design, material selection and surface treatments need to be connected and integrated in order to overcome the limitation and produce high performant components for a specific application.





GOAL AND INTRODUCTION

Anodizing of cast aluminum alloys have limitations because of the high silicon content. For improved anodization it is therefore important to identify the mechanism of how Si level and morphology affect the anodization process and the final properties. The goal is therefore to identify the hindering factors and propose solution for a good anodization of cast Al.
Electroplating of nanocomposite coatings is a new alternative to tailor surface characteristic and give to the component new enhanced properties. By adding hard ceramic nanoparticles to the electroplated layer, harder coatings could be produced to replace Cr.

RESULTS

Rheocal project proved how interconnected Si flakes are the major cause of the defects and crack in the oxide layer reducing the anodizing performance. Moreover, the project demonstrated the efficiency of the Si modification for improving the oxide layer properties and have a protective defect free anodization.
PROCETS project developed Ni-based coatings with different nanoparticles for improved surface microhardness and wear resistance. Hardness was increased of 40% by particles addition in as plated coatings and heat treated ones. Heat treated coatings showed an exceptional hardness for metallic coatings, even greater that the one provided by Cr.

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INDUSTRIAL IMPACT

The industrial impact of the 2 projects is to improve the surface treatments quality so that cast component can be treated efficiently with the optimized processes. Main limiting factors can be hindered by modifying the cast microstructure or by developing tailored composite coatings opening to the possibility of improve the added value given by surface treatments.

PROJEKTUTFÖRARE

FINANSIÄR