

USING GREEN SURFACE TREATMENTS FOR NANO COATINGS ON METALS IN 21ST CENTURY

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Abstract

The objective of this talk is to give an overview of the research done in Europe to replace conventional surface treatments applied on metal surfaces with new green based technologies. If one considers the trends in aerospace, automotive, naval, architectural and offset applications; there is a huge drive to replace conventional coating protection systems with more advanced green technology. Typical examples are the replacement of Cr6+ based conversion systems or Cr6+ corrosion pigments combined with solvent free coatings. New systems are dealing with multifunctional properties such as corrosion protection, self-healing, self-cleaning, improved adhesion, ... Currently several industries are implementing these technologies facing the urgent need to have reliable prediction of the life time of these treated metals. Examples are for example the introduction of zirconium& titanium oxides or silane based conversion coatings, or e.g. the introduction of Li based corrosion pigments in organic coatings for aerospace or even complete new processing based on atmospheric plasma based primers as a replacement of waterborne organic coatings.

The implementation of these new systems requires the detailed understanding of the interaction of the metal substrate with the surface treatments. Industry mixes currently steel, aluminium, zinc and even magnesium in several application. The metal (oxide) surface to be treated is reflecting the history of the whole metallurgical process including alloy selection, heat treatments, deformation and pre-cleaning steps. Depending on this history the metal surface will show a certain (electro)chemical reactivity towards the applied surface treatment.

During the lecture it will be shown how the metal physical properties affect these new surface treatment processes. Influence of texture, phase composition and presence of nano-oxide films will be discussed. It will be shown how they can be analysed and how they affect the surface treatments. In addition in situ surface analysis will be introduced. While current analytical tools to study metal surfaces operate under vacuum or different ambient conditions, there is a clear international research trend to make them accessible for in-situ applications.

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