

12th International Conference and Exhibition on **Materials Science and Chemistry**
&
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Nano structuration of thin films an alternative solution for hard chromium coating replacement

Hard chrome plating is used by Original Equipment Manufacturer to provide sealing surface for hydraulic seals, wear resistance to moving parts and corrosion protection to a wide variety of components for aircraft. The main areas of hexachromium using processes are mechanical, automotive, aerospace and military. By improving tribological properties (superior hardness) and corrosion resistance (natural ability to react with element such as oxygen), hard chromium can lower energy consumption of moving parts and machinery, reduce the need to replace parts frequently, leading to reduce waste and improve efficiency. The hard chrome plating is a powerful, simple and cheap process. From an environmental point of view, this process itself involves the use of highly toxic substances, such Cr^{6+} and lead compounds. The Restriction of Hazardous substances Directive (Reach) was issue, banning several toxic substances including Cr^{6+} . Hard chromium electroplating has been also classified by the U.S. Environmental Protection Agency (EPA) as an environmentally unfriendly process. Now, several hard chrome plating alternatives have been developed depending on the application: 1) High Velocity Oxy-Fuel thermal sprays for repairs and for the deposition of high-quality hard-metals and metals coatings, 2) Electro and electroless plates; 3) Vacuum coating, 4) Heat treatments, 5) Laser and weld coatings. Due to its complex mix of properties, no single coating will replace hexavalent chromium in all applications. In this presentation, the exploration of the potential of nanostructured coating elaborated with innovative processes, will be discuss as an efficient alternative solution for hard chromium coating replacement. The opportunity to use architecture coating will be presented. Various families of materials will illustrate the correlation between process-Nano structuration and final properties.

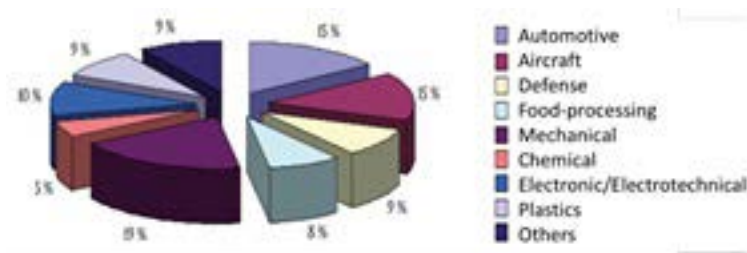


Figure 1 The main application areas of hexachromium based coatings
<http://www.cromit.fr/pdf/risques-professionnel/dte-220-traitement-de-surface.pdf>

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Recent Publications

1. B Le Gloanec, A Deschamps, F De Geuser, C Pouvreau and A Poulon-Quintin (2019) Ferritic and martensitic ODS steel resistance upset welding of fuel claddings: weldability assessment and metallurgical effects. *Journal of Nuclear Materials* 3:13.
2. S Allain, S Gaudez, G Geandier, J-C Hell, M Gouné, F Danoix, M Soler, S Aoued and A Poulon-Quintin (2018) Internal stresses and carbon enrichment in austenite of Q&P steels from High Energy X-Ray diffraction experiments. *Materials Science & Engineering A* 710:245-250.
3. B Giroire, M Ali Ahmad, G Aubert, L Teule-Gay, D Michau, J J Watkins, C Aymonier and A Poulon-Quintin (2017) A comparative study of copper thin films deposited using magnetron sputtering and supercritical fluids deposition techniques. *Thin Solid Films* 643:53-59.
4. M Cheviot, M Gouné and A Poulon-Quintin (2015) Monitoring tantalum nitride thin film structure by reactive RF magnetron sputtering: Influence of processing parameters. *Surface Coating and Technology*, 284:192-197.

Biography

Angeline Poulon-Quintin is an Associate Professor at the University of Bordeaux and ICMCB. She has a long experience in the correlation between process parameters, textures, microstructures and properties of structural and functional materials. Her current interests range from the search for innovative multifunctional coatings to the development of green processes to elaborate intermetallic compounds and/or nanostructured materials with innovative architecture, for applications in energy, aerospace and aeronautical industries. She is a Specialist in fine characterization with an extended recognized experience in electronic microscopy and physico-chemical techniques. She has co-authored 36 peer-reviewed articles, 40 oral presentations, 14 invited conferences and 4 patents.

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