



## Steam generated conversion coating on aluminium alloys

Din, Rameez Ud; Jellesen, Morten Stendahl; Ambat, Rajan

*Publication date:*  
2014

*Document Version*  
Peer reviewed version

[Link back to DTU Orbit](#)

*Citation (APA):*

Din, R. U., Jellesen, M. S., & Ambat, R. (2014). *Steam generated conversion coating on aluminium alloys*. Abstract from AeroMat, Orlando, United States.

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

## **Steam generated conversion coating on aluminium alloys**

Rameez Ud Din, Morten S. Jellesen, Rajan Ambat, Department of Mechanical Engineering,  
Technical University of Denmark, Kgs. Lyngby, Denmark

Aluminium and its alloys are widely used in aerospace industry owing to their high strength to weight ratio. The surface of aluminium under normal conditions has a thin oxide film (2.5-10 nm) responsible for its inherent corrosion resistance. This oxide film can further be converted or transformed into functional conversion coatings in order to enhance corrosion resistance and adhesion to paint systems. Chromium based conversion coatings have been extensively used on aluminium alloys to improve adhesion of subsequent paint layers and corrosion resistance. However, the use of hexavalent chromium is strictly regulated due to its toxic nature and suspected carcinogenicity. So, it is highly imperative to develop other alternatives for chrome conversion coatings. Treatment of aluminium with natural water at elevated temperatures results in the formation of different forms of aluminium oxide ( $\gamma$ -AlO(OH) , Al(OH)<sub>3</sub>) depending on the preparation parameters/conditions. Moreover, with the knowledge of factors controlling film growth, composition and morphology, such oxide layers carry huge potential for practical applications.

Pure aluminium (AA1090, 99.94 wt. %) and other aluminium alloy surfaces were exposed to high pressure steam produced by an autoclave at a temperature of 107 – 121 °C and pressure of 15 -17 psi for 10 minutes to produce a thin coating of aluminium oxide. The aim of this study is to understand the effect of high pressure steam with and without different chemical additives on surface morphology and growth of oxide film on different intermetallic particles and corrosion behaviour of such alloys. Surface morphology was observed by using FEG-SEM, EDX and FIB-SEM. Metal oxide surface characterization and compositional depth profiling were investigated by using XPS and GD-OES respectively. Potentiodynamic polarization measurements and acid salt spray testing were used to study corrosion behavior of the produced coatings.