

Accepted Manuscript

High Speed Video Evidence for Localised Discharge Cascades during Plasma Electrolytic Oxidation

A. Nominé, S.C. Troughton, A.V. Nominé, G. Henrion, T.W. Clyne

PII: S0257-8972(15)00077-8
DOI: doi: [10.1016/j.surfcoat.2015.01.043](https://doi.org/10.1016/j.surfcoat.2015.01.043)
Reference: SCT 20058

To appear in: *Surface & Coatings Technology*

Received date: 15 December 2014
Accepted date: 18 January 2015



Please cite this article as: A. Nominé, S.C. Troughton, A.V. Nominé, G. Henrion, T.W. Clyne, High Speed Video Evidence for Localised Discharge Cascades during Plasma Electrolytic Oxidation, *Surface & Coatings Technology* (2015), doi: [10.1016/j.surfcoat.2015.01.043](https://doi.org/10.1016/j.surfcoat.2015.01.043)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Re-submitted to *Surface & Coatings Techn.*, Jan. 2015

HIGH SPEED VIDEO EVIDENCE FOR LOCALISED DISCHARGE CASCADES DURING PLASMA ELECTROLYTIC OXIDATION

A Nominé^{#†}, SC Troughton[§], AV Nominé^{#†}, G Henrion[†] & TW Clyne^{§}*

[†] Institut Jean Lamour
CNRS
Université de Lorraine, 54011 Nancy, France

[§] Department of Materials Science & Metallurgy
Cambridge University
27 Charles Babbage Road, Cambridge CB3 0FS, UK

[#] Department of Physical Sciences
Open University
Walton Hall, Milton Keynes MK7 6AA, UK

Abstract

Information is presented from high speed video imaging of the free surface of coatings being grown on aluminium substrates by PEO processing. The exposure time during image capture ranged down to 5.5 μs , while the linear spatial resolution of the images ranged upwards from about 12 μm . The area being viewed was about 2.4 mm^2 , which was taken to be representative of the substrate area as a whole ($\sim 129 \text{mm}^2$). PEO Processing was carried out at 50 Hz AC. The periods over which image sequences were captured was about 100 ms, covering several cycles of variation of the applied potential. This operation was repeated periodically while the coating thickness increased from a few microns to several tens of microns. During the imaging periods, it was typically observed that tens or hundreds of individual discharges were occurring, all of them readily distinguishable from the background light levels. Their duration was of the order of several tens of microseconds. It was noticeable that they tended to occur in “cascades” at particular locations, each sequence comprising tens or hundreds of individual discharges, with an “incubation” period between them of the order of several hundreds of microseconds. It seems likely that they all occurred during the positive (anodic) half-cycle, while the applied voltage was sufficiently high. An individual cascade tended to persist (at the same location) over several voltage cycles. As the coating became thicker, these characteristics broadly persisted, although individual discharges became longer-lived and more energetic. An attempt is made to relate these observations to the overall picture of how coating growth takes place during PEO processing, and also to the overall energy consumption.

Keywords: plasma electrolytic oxidation, cascades, electrical discharges, high speed photography.

* tel: 0044 1223 334332: e-mail: twc10@cam.ac.uk

Download English Version:

<https://daneshyari.com/en/article/8026785>

Download Persian Version:

<https://daneshyari.com/article/8026785>

[Daneshyari.com](https://daneshyari.com)