Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Multi-physics study of plasma in liquids: The case of Plasma Electrolytic Oxidation (PEO) ALEXANDRE NOMINE[1], Institut Jean Lamour - CNRS - Universite de Lorraine, SAM TROUGHTON, University of Cambridge, ANNA NOMINE[2], GERARD HENRION, Institut Jean Lamour - CNRS - Universite de Lorraine, BILL CLYNE, University of Cambridge — PEO is a promising technique in order to grow rapidly oxide coatings with high corrosion and wear resistance. Oxidation is driven by millions of simultaneous micro-discharges (MD) that occur at the interface between the substrate and the liquid electrolyte. However, the mechanisms of breakdown and the subsequent oxidation are not well understood yet. Current profiles and Ultra-Fast Imaging of single discharges allows to correlate the size and life-time of the discharge with different electric parameters (Q, Imax). MD are found to appear in cascade, switching on and off with a frequency in the order of 1–10 kHz. Formation of a bubble is observed directly after the ignition of the discharge. The growth rate that varies between 1 and 10 m/s, is used to estimate the gas pressure in the bubble. The influence of the pulse frequency on the bubble shape and on the coatings will be presented. MD size and life time are known to increase with coating thickness presumably due to higher charge accumulation. This study shows that ms scale, the evolution of MD size and life time evaluates similarly, suggesting that the coating thickness is not the only parameter governing the MD size and life-time.

[1]second affiliation: The Open University
[2]second affiliation: The Open University

Alexandre Nomine
The Open University

Date submitted: 19 Jun 2015 Electronic form version 1.4