

# Abstract for CEOCOR 2019

Copenhagen, May 21-24.

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Title: **Pulsed deposition of metals from aqueous solutions and the possible similarities to AC corrosion**

Electrodeposition of metals, such as nickel, copper, zinc and chromium, from aqueous solutions is an old and widely used technique within the field of surface treatment – and thus also in corrosion protection. Pulsed deposition of metals, or pulse plating, is a more recent attempt to improve the processes and to tailor the properties of the deposited metal. In this paper pulse plating is utilized for very different purposes, ranging from electroforming of nickel for rocket engines to deposition of soft magnetic alloys for microfluidic applications. The deposition, in all cases, takes place during cathodic pulses ranging in time from 10 to 100 ms. In order to modify the diffusion layer, and to improve the material distribution, anodic pulses are also applied – leading to dissolution of a fraction of the deposited metal in each cycle.

Compared to corrosion, and in particular AC corrosion, pulse plating does hold some similarities. Although the activity of the metals ions in the soil surrounding a pipe line is not as high as in an electrolyte for nickel plating, the frequency of the pulse plating cycle can be compared to AC frequencies and the local changes in pH and concentration of ions will also follow the same patterns.

This paper will explain the advantages and challenges of pulse plating – through a number of examples – and then try to compare the electrochemical mechanisms involved to those found in AC corrosion. This will also include speculations into using a pulsed cathodic protection level that is “in phase” with the imposed alternating current – as a way to minimize AC corrosion on pipe lines operating close to AC power.