

Abstract No. srin507

Volta Potential Measurements on Corroded Al Under Paint

V. Srinivasamurthi (Northeastern University), H. Lee (BNL), K. Sasaki (Ohio State University), G. Adzoc (BNL), H. and S. Isaacs (BNL)

Beamline(s) X18B

Introduction: The objective was to develop a nondestructive technique to locate the presence of corrosion on Al under an organic film to reduce the amount of repainting that is performed at aircraft rework facilities.

A method for direct dc measurements of Volta potential was carried out to investigate corrosion under paint coating. A high intensity synchrotron x-ray beam was used to locally irradiate the air adjacent to painted sample and produce a conducting ionized gas path between the sample and a reference probe. X-ray induced ionization of air has enabled Volta potential of metals to be measured directly with high impedance voltmeter similar to the measurements made in liquid electrolyte.

Methods and Materials: In order to determine corroded area of Al samples under an intact film of paint, Volta potential measurements were performed in the NSLS beam line 18B. The x-ray beam was positioned to impinge the paint just below the probe. A silver / silver chloride wire reference probe was placed 1mm from the sample and potential difference between the probe and the sample was recorded with an electrometer. The sample was partially corroded Al alloy 2024 painted with an organic coating. The thickness of the paint was 3.6mil. Mapping of the surface was achieved by moving the sample with stepping motors. Humidified air was also introduced over the surface of the sample to reduce static charge during the measurements

Results: The 3D image of the Volta potential difference between the probe and the painted sample shows distinct difference between the corroded and non-corroded areas. It also shows non-uniformity in the topography of corroded area. The direct measurements of potential compared favorably with traditional Kelvin probe measurements. Both methods show possibility to locate corrosion under 3.6 mil thick film of paint. The direct measurements have a poorer spatial resolution but the measurements could be made at probe heights of around 1mm compared to less than 0.1mm for the Kelvin probe.