

## **An overview of an electrochemical noise technique to study the protection afforded by organic coatings to both standard metal items and to museum artefacts**

**By Dr Sarah Leeds (DCVG Ltd), Dr Douglas Mills (Northampton University), Katarzyna Schaefer (National Maritime Museum, Gdansk) & Tianyang Lan (Northampton University)**

Electrochemical Noise Method (ENM) has been investigated as a means of monitoring non-destructively the corrosion and level of protection being provided by an organic coating on a standardly coated metal, normally steel, substrate and on steel and copper alloy heritage artefacts, the latter after having had thin conservation coatings applied. ENM involves measuring the very small voltage and current fluctuations that arise due to the electrochemical activities taking place within the coated system. Normally all electrochemical noise measurements require three electrodes. The standard method involves using two nominally identical specimens and a reference. When measurements are being conducted in a laboratory this is typically a saturated calomel electrode. Measurements are then recorded into a portable monitoring device to obtain a value of Resistance Noise ( $R_n$ ). This  $R_n$  value has been shown to be equivalent to the DC resistance and good correlation has been obtained between this value and the protective nature of the coating. The ENM technique is currently being developed to enable it, while still making the measurement through the coating, to obtain information about the rate of corrosion underneath the coating eg on a pipeline; also, development of pseudo reference electrodes (probes) is taking place to enable ENM to be used in the field.

**Keywords:** Electrochemical Noise Method (ENM), Resistance Noise ( $R_n$ ), Coatings, Corrosion, Pipelines