

# The effect of electric field on potentiometric Scanning Electrochemical Microscopic images

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## Abstract

Scanning Electrochemical Microscopy (SECM) is an invaluable tool in corrosion science. It allows the selective imaging of a particular ionic species being released at the anodic sites, using ion-selective microelectrodes (ISMEs) as scanning probes. An often studied phenomenon is galvanic corrosion, which involves two metals in electrical contact, immersed in the same electrolyte. The measured potential of the ISME is thought to depend only on the activity of primary ion. However, an electric field is also formed as a result of the ..., which has a direct influence on the potential of microelectrode. Therefore, the measured potential is the sum of these two. The potential caused by the electric field can be substantially large, exceeding that of the potential associated with the activity of the primary ion. In this paper, we present experimental evidence of this, and investigate the extent to which it influences the final image.

**Keywords:** scanning electrochemical microscopy, potentiometry, galvanic corrosion, electric field

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## 1. Introduction

Citation [1].

## 2. Theory

Eq. 1 describes the transient cell response when the measuring electrode is brought to contact with a solution of different analyte activity.

$$E_{cell}(t) = E_{cell}(\infty) + [E_{cell}(0) - E_{cell}(\infty)]e^{-t/RC} \quad (1)$$

## 3. Material and methods

## 4. Results and discussion

## 5. Conclusions

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## References

- [1] P. J. Eaton, P. West. Atomic force microscopy. Vol. 10. Oxford: Oxford University Press, 2010.

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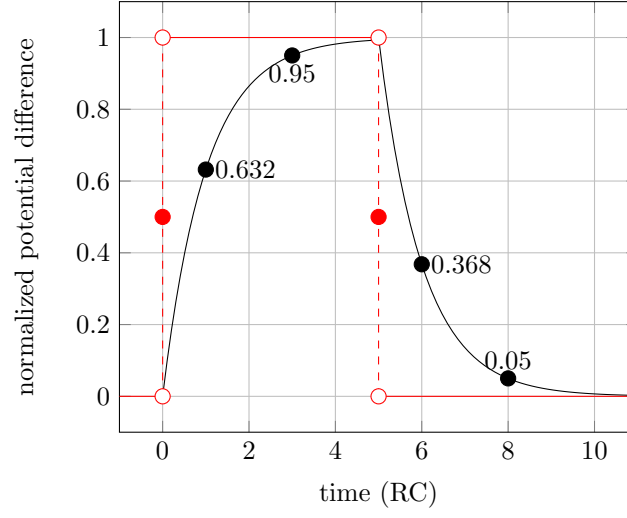


Figure 1: Charging and discharging the series  $RC$  circuit. Red: normalized input voltage ( $V_{in}$ ) to the series  $RC$  circuit, two consecutive *Heaviside step functions*, the second one is inverted and shifted  $5RC$  to the right. Black: normalized output voltage ( $V_{out}$ ) of the series  $RC$  circuit.

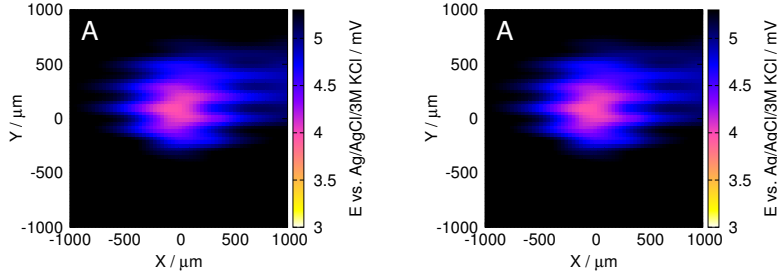


Figure 2: Caption.

Table 1: Comparison of the scanning algorithms.

Algorithm	Number of sampling points	Total scan time (s)	Mean squared error
Meander	441	440	$2.75 \times 10^{-2}$
Fast comb	441	520	$2.07 \times 10^{-2}$
Comb	441	881	$2.75 \times 10^{-2}$
Web	110	109	$9.63 \times 10^{-3}$
Arc	341	340	$2.95 \times 10^{-3}$

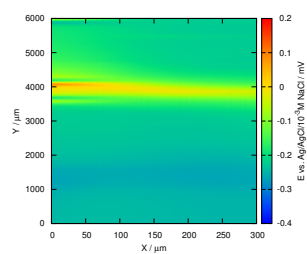


Figure 3: Caption.