

# SPATIAL DISTRIBUTION OF CHEMICAL SPECIES IN AQUEOUS SOLUTION NEAR A GALVANIC COUPLE THAT SIMULATES CATHODIC PROTECTION

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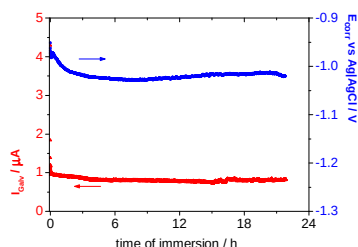
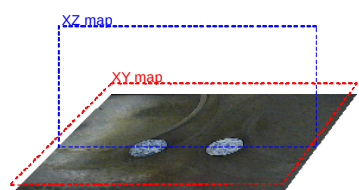
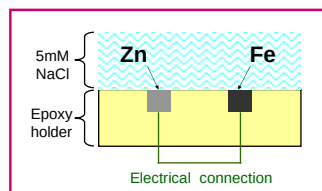


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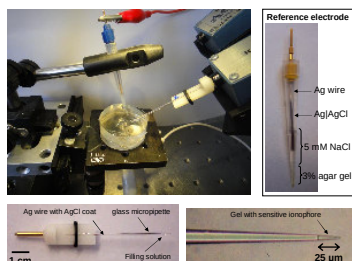
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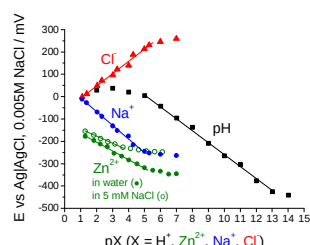
## Galvanic cell



## Micro-potentiometry

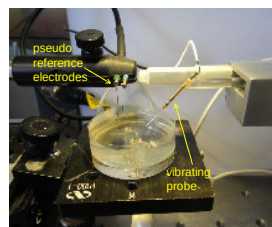


|                  | Ionophore                                                  | Internal Solution                                                                          | LIX column |
|------------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------|
| pH               | Hydrogen I cocktail B<br>Fluka 95293                       | 0.1M HCl + 0.01 M<br>KH <sub>2</sub> PO <sub>4</sub>                                       | 25         |
| Zn <sup>2+</sup> | Tetra-n-butyl thiuram disulfide<br>based homemade cocktail | 0.1M KCl + 0.01M<br>KH <sub>2</sub> PO <sub>4</sub> + 10 <sup>-4</sup> M ZnCl <sub>2</sub> | 70         |
| Na <sup>+</sup>  | Sodium Ionophore II cocktail A<br>Fluka 71178              | 0.1M NaCl + 0.01M<br>NaH <sub>2</sub> PO <sub>4</sub>                                      | 50         |
| Cl <sup>-</sup>  | Chloride ionophore I cocktail A<br>Fluka 24902             | 0.1M NaCl + 0.01M<br>NaH <sub>2</sub> PO <sub>4</sub>                                      | 30         |



## SVET

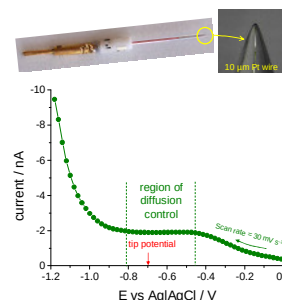
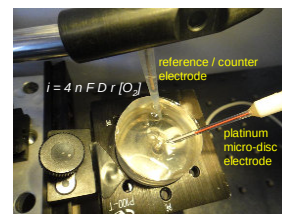
(Scanning Vibrating Electrode Technique)



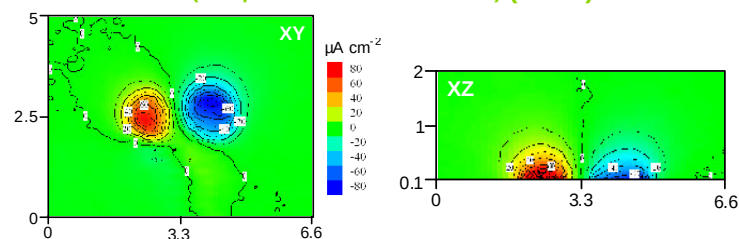
$$I = \frac{E}{\rho} = -\frac{1}{\rho} \frac{\Delta V}{\Delta r}$$

Instrumentation from Applicable Electronics Inc. (MA, USA).  
Galvanic current and OCP measured with Autolab (Eco Chemie, NL) equipment.  
XY maps measured in a plane 100 μm above the surface.  
XZ maps measured between 100 and 2000 μm from the surface.  
Maps usually with 40x40 points, sometimes with 40x20 points.

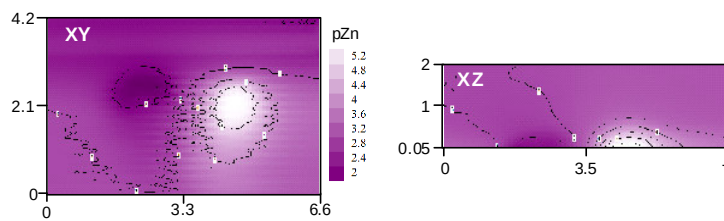
## Micro-amperometry



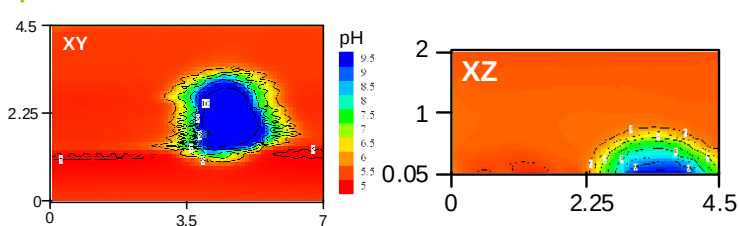
## Ionic currents (component normal to surface) (SVET)



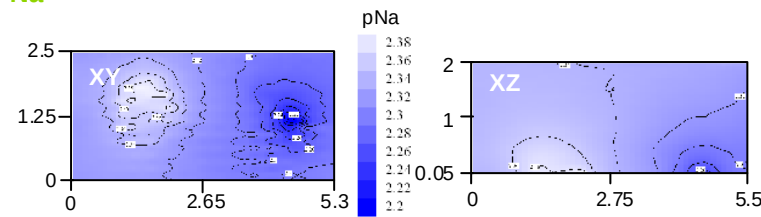
## Zn<sup>2+</sup>



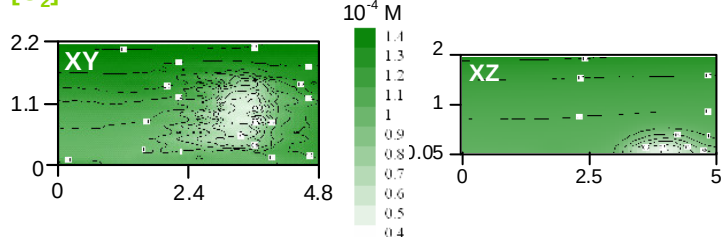
## pH



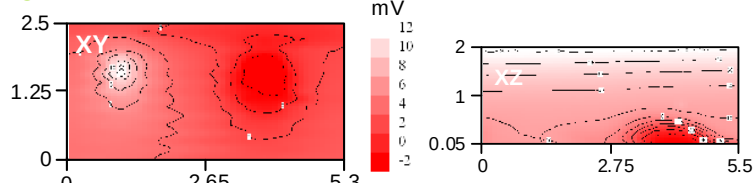
## Na<sup>+</sup>



## [O<sub>2</sub>]



## Cl<sup>-</sup>



These results will be used to model the galvanic corrosion of the Zn-Fe couple and to check the need for more data other than potential and current in solution. The work will continue following two directions:  
i) Measurement of the same chemical species in electrochemical cells of different geometry and larger dimensions (up to real structures);  
ii) Use of these data as input for chemical speciation and geochemical modeling of the chemical transformations occurring in the vicinity of corroding surfaces.

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