

# Obtaining more from the electrical chloride test

Claisse, P.A. and Beresford, T.W.

Presentation slides deposited in CURVE April 2014

**Original citation & hyperlink:**

Claisse, P.A. and Beresford, T.W. (1997) 'Obtaining more from the electrical chloride test'. Presentation slides from the *CANMET/ACI conference on the durability of concrete* 1997. American Concrete Institute

<http://www.concrete.org/PUBS/JOURNALS/OJDetails.asp?Home=SP&ID=6870>

**Additional note:**

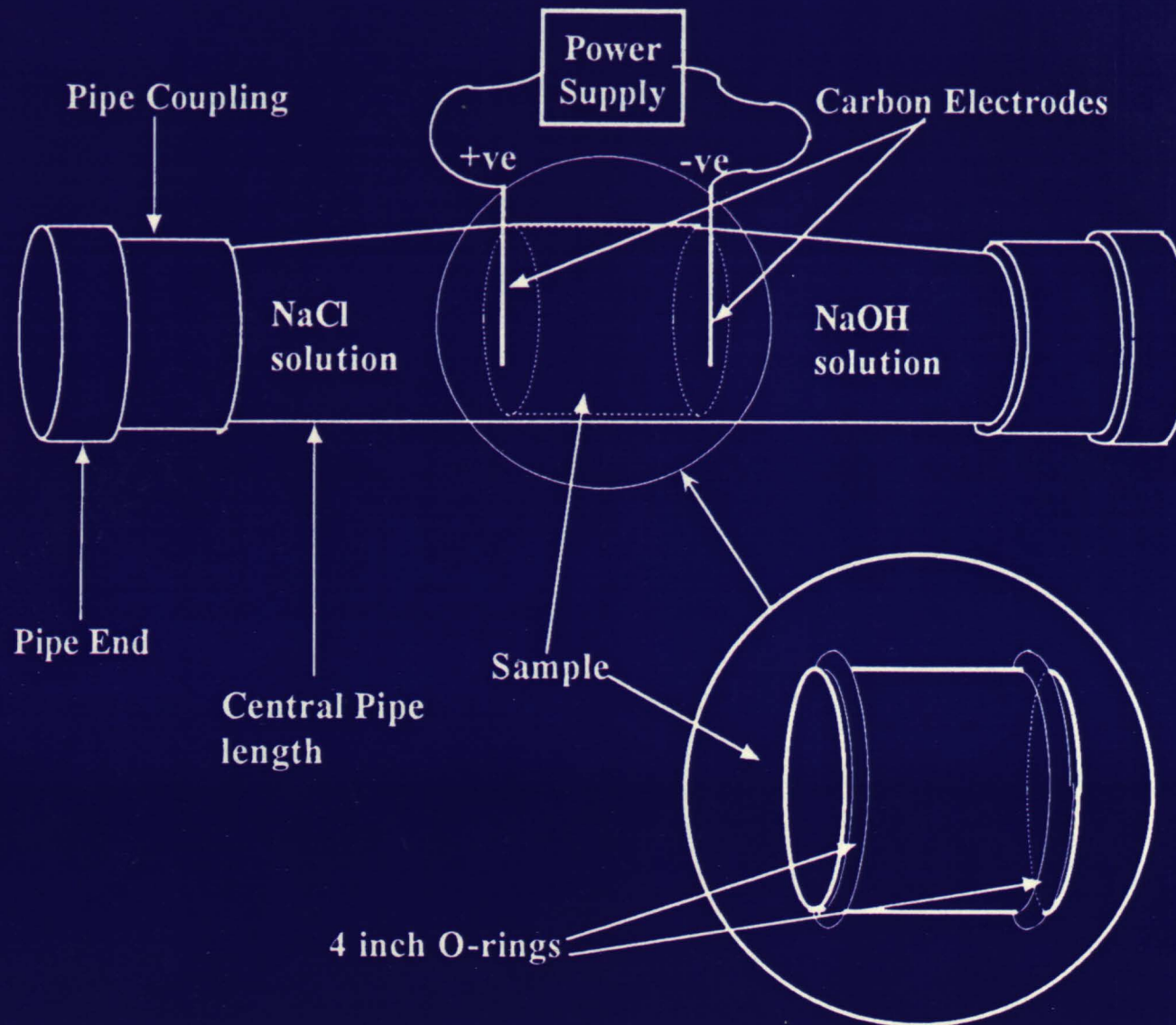
This file contains the presentation slides. The published version of the paper is also available from: <https://curve.coventry.ac.uk/open/items/9a5db42b-afdf-4dfa-930e-ce90ef791784/1/>

Copyright © and Moral Rights are retained by the author(s) and/ or other copyright owners. A copy can be downloaded for personal non-commercial research or study, without prior permission or charge. This item cannot be reproduced or quoted extensively from without first obtaining permission in writing from the copyright holder(s). The content must not be changed in any way or sold commercially in any format or medium without the formal permission of the copyright holders.

**CURVE is the Institutional Repository for Coventry University**

<http://curve.coventry.ac.uk/open>

# The modified test cell



## **Limitations on modelling methods based only on the chloride ion**

- **The movement of chloride ions will be limited by the requirements of charge neutrality which is controlled by the movement of other ions, e.g. hydroxyl, sodium and potassium.**
- **At the start of the test none of the current can be carried by chloride ions because there are none in the sample.**
- **In pozzolanic samples the depletion of hydroxyl ions causes the current to fall during the test. In other samples with similar chloride diffusion coefficients it rises.**



## Objectives of the present work

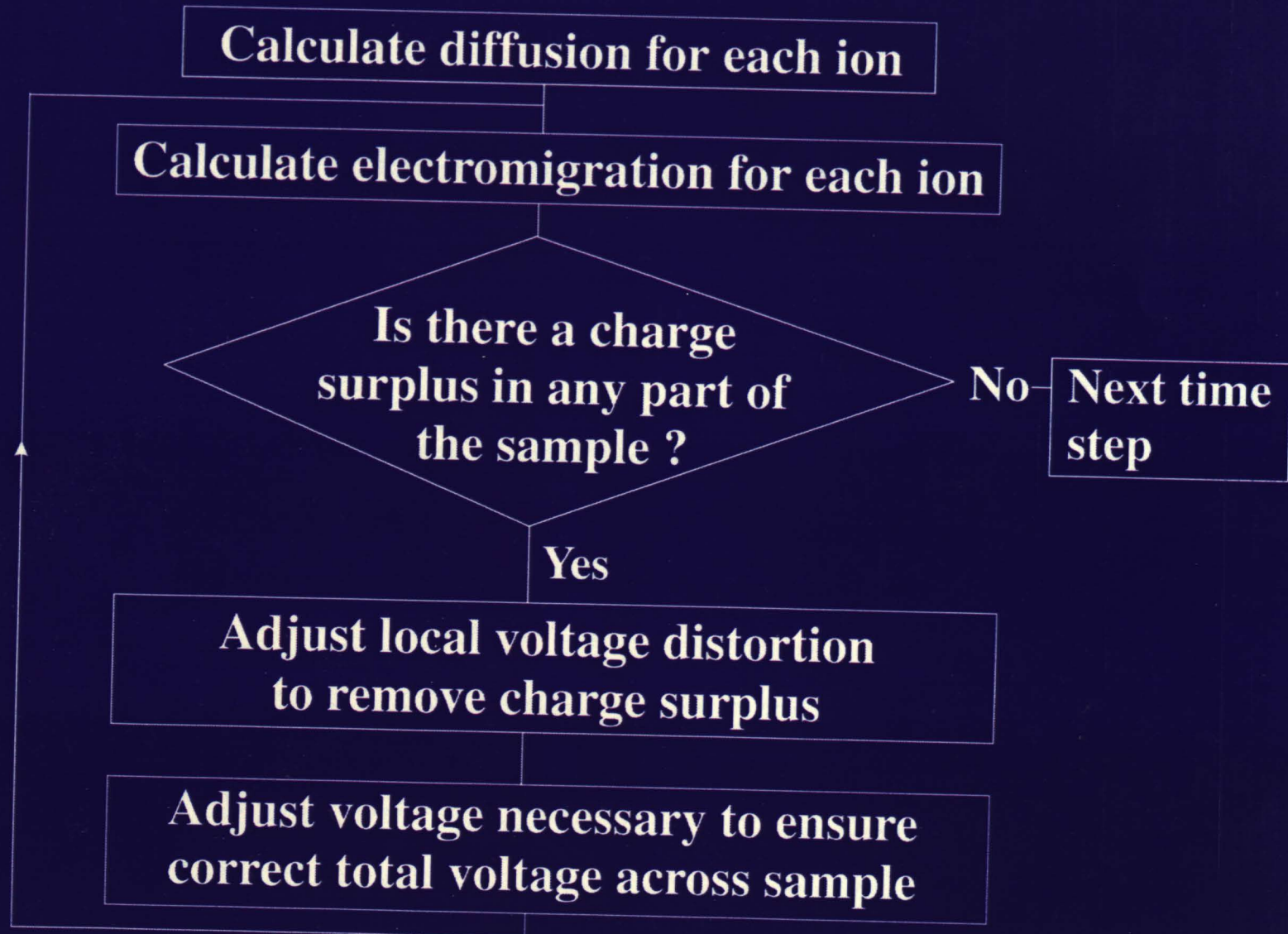
- To produce a model which explains the observed results from the test including the current-time transients.
- To use the input data to the model (i.e. the diffusion coefficients for the different ions) to provide good predictors for the potential durability of structures.

## Voltage adjustment in the model

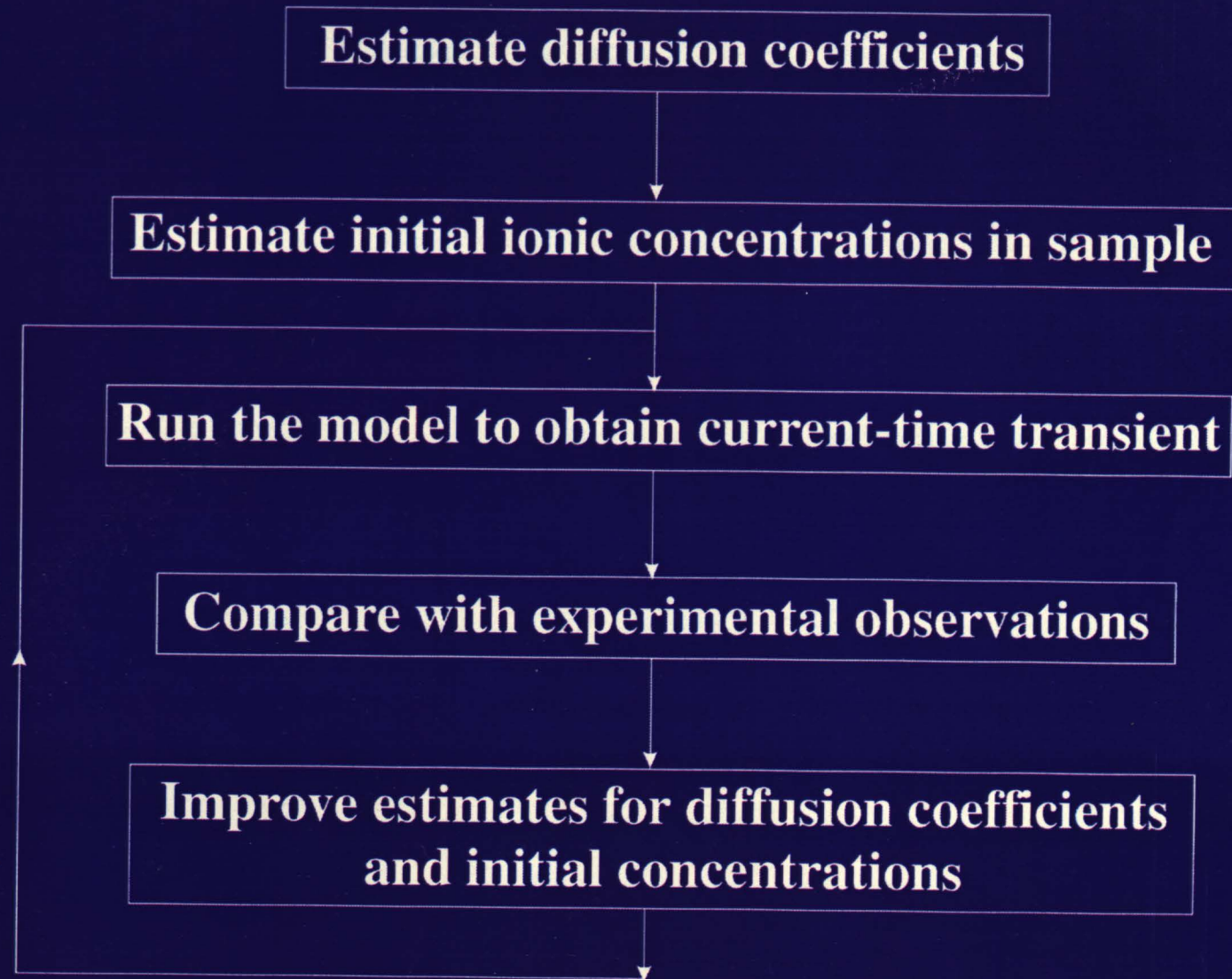
No significant charge build up can occur anywhere in the sample. Any surplus of positive or negative ions flowing into one part of the sample will produce local electric fields which would cause it to disperse. These fields will cause minor distortions in the voltage gradient in the sample and will, for example, prevent free negative chloride ions moving into the sample without corresponding movement of other ions to maintain charge neutrality.

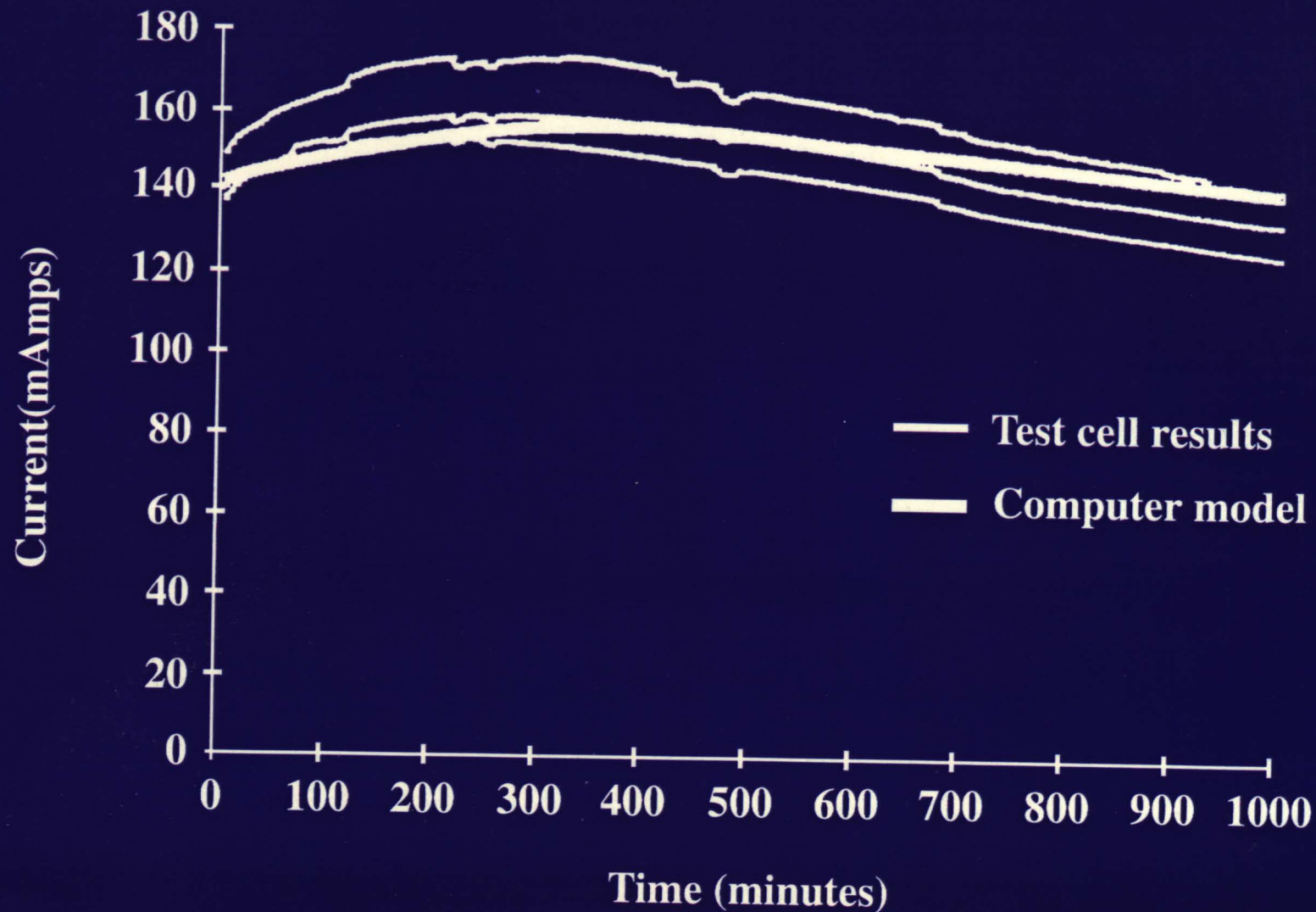


# Calculations in the numerical model at each time step



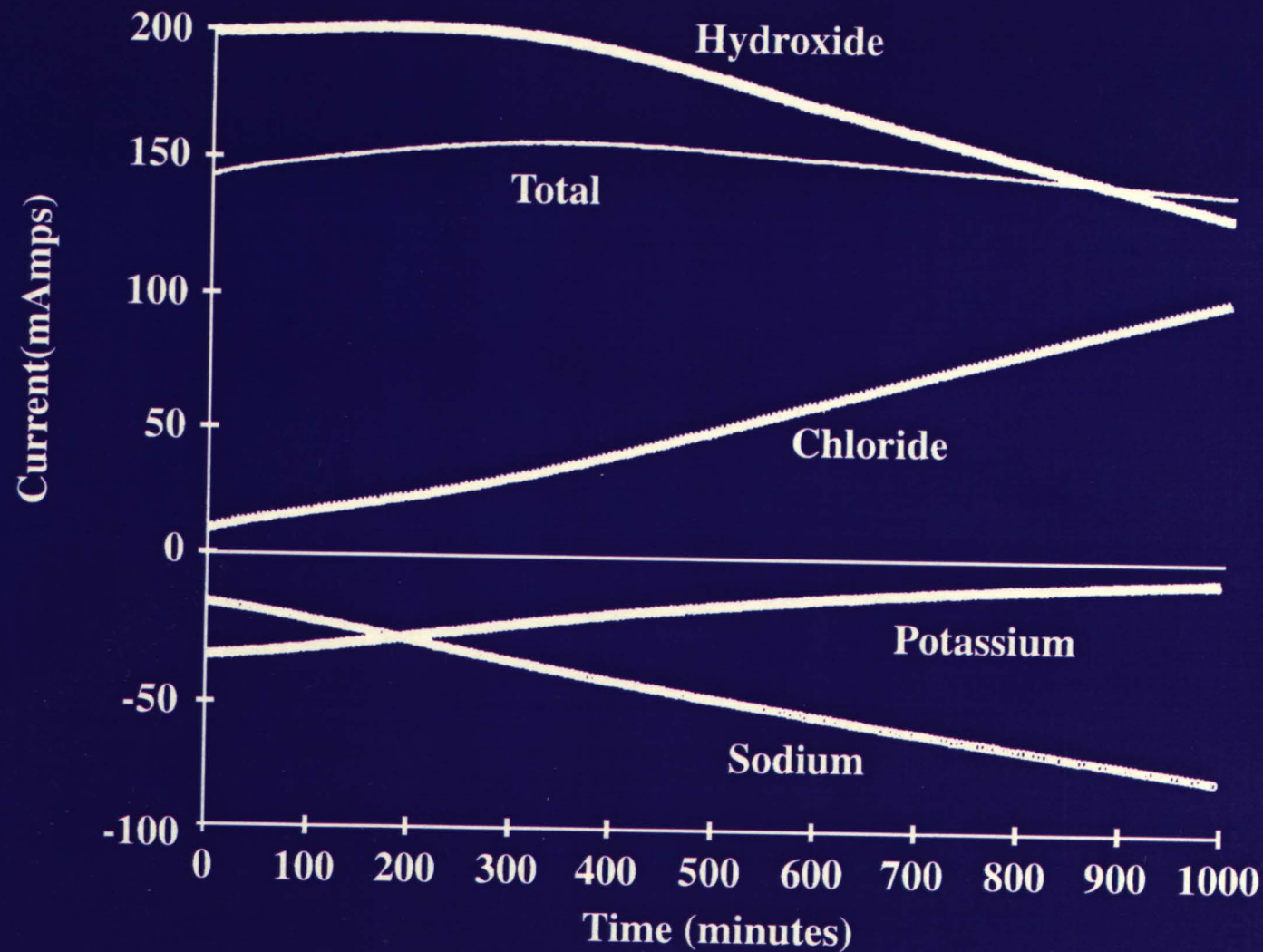
# Using the model



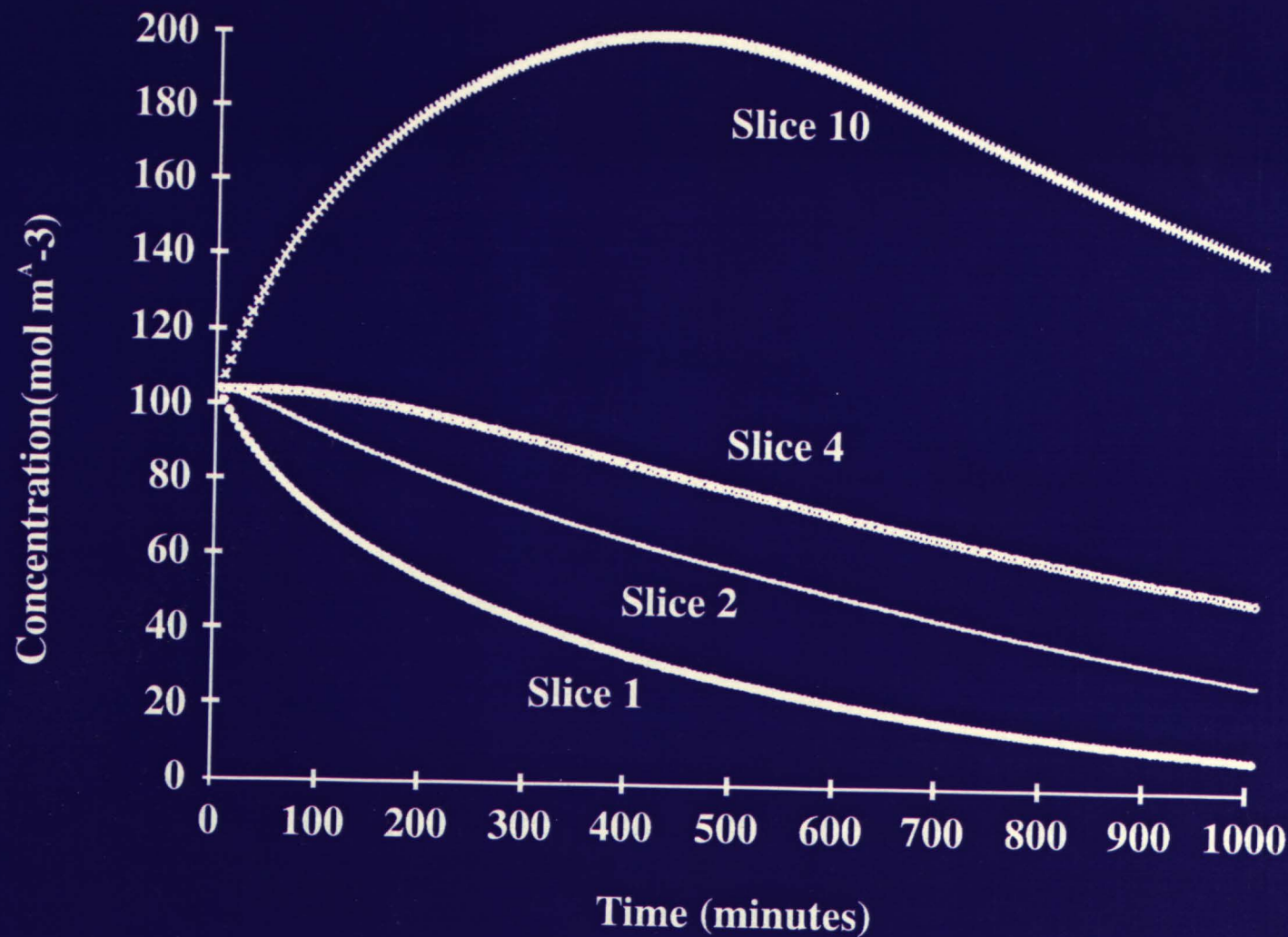


**Figure1.** Comparison of the computer model versus experimental results on portland cement, w/c = 0.3, 28-day cure. Applied potential is 40V



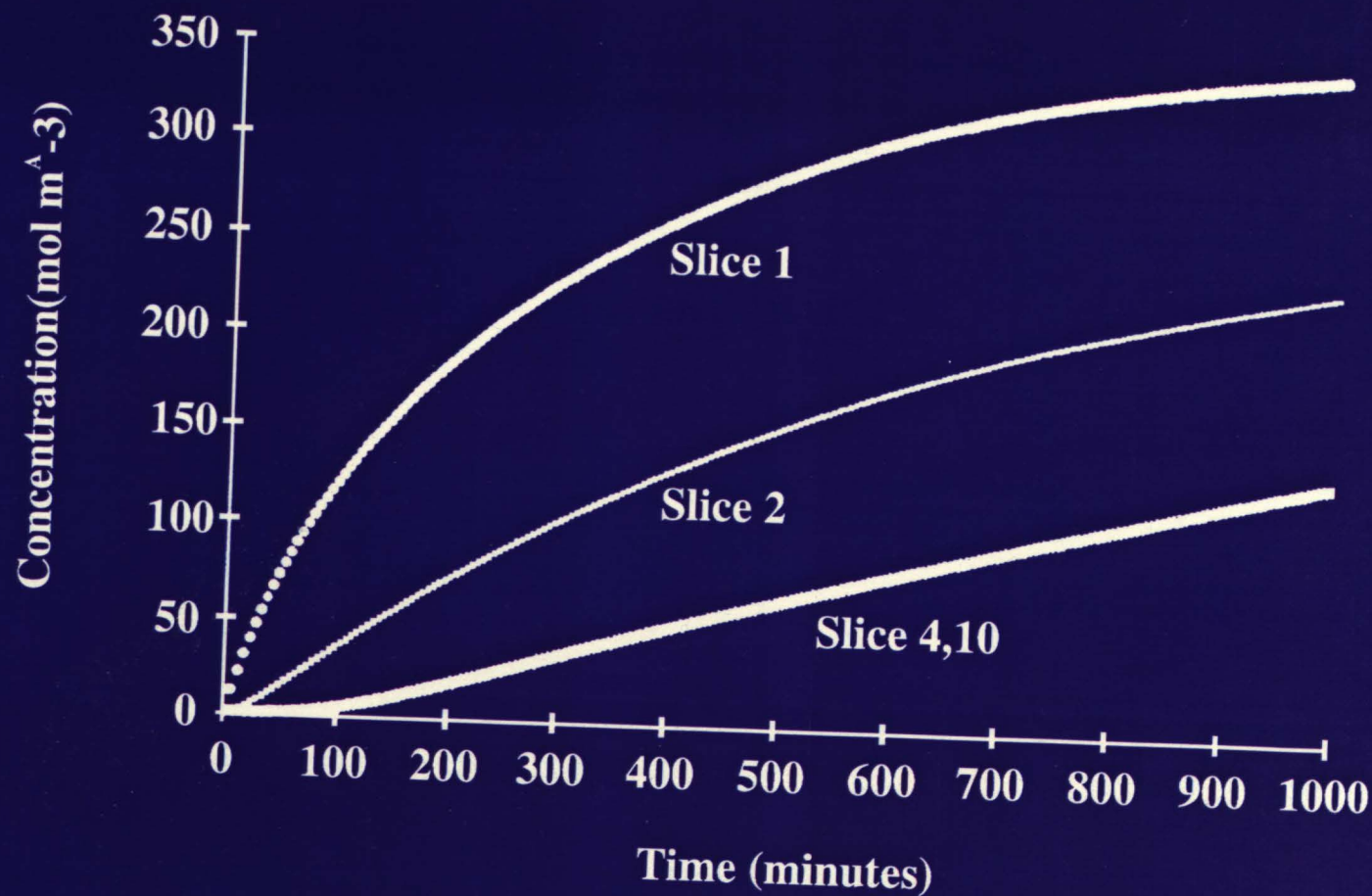


**Figure 3.** From the computer model, the current predicted for all four ions compared to the total current predicted. Values correspond to those in Table 1



**Figure 4.** Hydroxide concentration in slice 1,2,4 and 10, when  $N=10$ , for the computer model using values in Table 1 (slice 1 is nearest NaCl solution)





**Figure 5.** Chloride concentration in slice 1,2,4 and 10, when  $N=10$ , for the computer model using values in Table 1 (slice 1 is nearest NaCl solution)



(12)

**The code for the model may be downloaded  
from our web pages:**

**<http://www.coventry.ac.uk/acad/sbe/civil/research.htm>**