

Problems associated with the measurement of chloride diffusion in concrete

Peter Claisse and Juan Lizarazo Marriaga.

It is now recognised that chloride diffusion values obtained from direct application of the Nernst-Planck equation for a single ion to migration tests using an applied voltage are inaccurate. This inaccuracy is caused by the presence of other ions and the need to maintain charge neutrality throughout the system. Thus tests such as the ASTM C1202 "Rapid Chloride Permeability Test" give misleading comparisons between concretes with different proportions of pozzolans.

This presentation will discuss data which indicates that applying Fick's law for a single ion to chloride diffusion tests without applied voltages is similarly very inaccurate. Even with no applied voltage an accurate analysis must use the full Nernst-Planck equation because the system will work like a battery and develop a voltage. This field will affect the migration of the chloride ions, their associated anions and also the mobile cations such as OH<sup>-</sup> which are already present in the sample.

Results will be presented both from a numerical simulation of a system with several different interacting species and also from experimental observations which validate the model.