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Cement and Concrete Research 35 (2005) 420

CEMENT AND CONCRETE RESEARCH

Discussion

A discussion of paper "Estimating the electrical conductivity of cement paste pore solution from OH^-, K^+ and Na^+ concentrations" by K.A. Snyder, X. Feng, B.D. Keen, T.O. Mason☆

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Received 30 March 2004

This paper reports the estimation of the electrical conductivity of mixed solutions of NaOH and KOH, which is discussed and demonstrated in most physical chemistry and electrochemistry textbooks [1]. It is true that the other species have much less effect on the electrical conductivity of cement paste pore solution than OH^-, K^+ and Na^+ do, but they do have some effect and can be considered into the estimation very easily. Actually, the estimation of electrical conductivity of cement paste pore solution has been well demonstrated in a previous publication [2] and is discussed in more details in a recent publication [3].

The authors "proposed" Eq. (3) or "a single-parameter model" to estimate the concentration dependence of the individual equivalent conductivity at 25 °C. However, no references or information was given on how the equation was derived. Actually, a single-parameter equation is described in most physical chemistry and electrochemistry textbooks, which appears to be obeyed to a concentration of about 0.1 M aqueous univalent ions, only slight deviations are observed for NaOH or KOH solutions up to a concentration of 1 M [1].

It stated that "Eq. (3) could characterize low concentration data well and remains reasonably accurate at concentrations near 1 mol/l." However, the data in Fig. 1 came from three sources. The data from Harned and Owen fit the equation well, but the data from the CRC Handbook and authors' experiments deviated far from the equation. The data from Harned and Owen could fit the equation well since they only ranged from 0.001 to 0.1 mol/l. The authors stated that "estimates at higher concentrations must rely on Eq. (3)." However, what is the reliability of Eq. (3)?

The authors compared the results from Eq. (3) with Eq. (9), as shown in Fig. 2a, to show readers the differences between the two equations. However, it is well known that the equivalent conductivity and conductivity of a solution are dependent on its the ionic concentrations. This comparison and the relevant discussions do not make sense at all and mislead readers.

Finally, the authors discussed the ionic transport in cement paste in the Discussion section. It seems that the discussions are not really related to the previous sections and deviated from the topic of the paper.

References

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[3] C. Shi, Effect of mixing proportions of concrete on its electrical conductivity and the rapid chloride permeability test (ASTM C1202 or ASSHTO T277) results, Cem. Concr. Res. 34 (3) (2004) 537–545.

☆ Cem. Concr. Res. 33 (6) (2003) 793–798.

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0008-8846/$ – see front matter
doi:10.1016/j.cemconres.2004.05.003