



Discussion

A discussion of the paper, “Influence of high temperature and low humidity curing on chloride penetration in blended cement concrete,”
by J.M. Khatib and P.S. Mangat[☆]

Mario Collepardi*

Department of Applied Physical Chemistry, Civil and Environmental Engineering Faculty, Politecnico of Milan, Via Mancinelli, 7-20131, Milan, Italy

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I have read the paper “Influence of high-temperature and low humidity curing on chloride penetration in blended cement concrete” authored by Khatib and Mangat.

The authors did not mention the results of papers published by Collepardi et al. [1–3] on the same subject anticipating many of the conclusions of Khatib and Mangat particularly those concerning the effect of pozzolanic materials on the chloride diffusion in concrete structures.

Moreover, Khatib and Mangat quote J. Crank (reference 22 of their paper) as the author indicating that “the rate of chloride penetration into concrete as a function of depth from the concrete surface and the time can reasonably be presented by Fick’s law of diffusion”. The first papers indicating and demonstrating that the rate of chloride penetration into concrete can be represented by the second Fick’s law were published by Collepardi, Marcialis and Turriziani on 1970–1972 [1–3]. This has been recognized by many researchers in this area. For instance Nilsson et al. [4], in the Hetek Report “Chloride penetration into concrete. State of the Art”, wrote:

Until Collepardi et al. (1970, 1972) published his model of diffusion of chloride into concrete, no mathematical model of chloride ingress was available. Therefore, during the “Precollepardian Period” the prediction of the cover over the reinforcement and the concrete composition necessary for the maintenance of a required service life were mainly based upon experience and rules of thumb.

I understand that Khatib and Mangat cannot read the paper published in Italian on 1970 on the application of the second Fick’s law to represent the chloride penetration [1]. However, they cannot ignore the paper published on Journal of the American Ceramic Society, 1972, [2] as well the paper published in English/Italian on *Il Cemento*, 1972, [3]: both these papers indicated that the chloride diffusion is increased by increasing the curing temperature and is decreased by using blended pozzolan- and slag-cement instead of pure Portland cement. In these papers, the authors also presented a mechanism to explain why these mineral additions reduce the diffusion of chloride ions through the cement matrix.

References

- [1] M. Collepardi, A. Marcialis, R. Turriziani, The kinetics of penetration of chloride ions into the concrete (in Italian), *Il Cemento* (1970) 157–164.
- [2] M. Collepardi, A. Marcialis, R. Turriziani, Penetration of chloride ions into cement pastes and concretes, *J. Am. Ceram. Soc.* (1972) 534–535.
- [3] M. Collepardi, A. Marcialis, R. Turriziani, The penetration of de-icing agents in cement pastes, *Il Cemento* (1972) 143–150.
- [4] L.O. Nilsson, E. Poulsen, P. Sandberg, H.E. Sorensen, O. Klinghoffer, HETEK, Chloride Penetration Into Concrete, State of the Art, Transport Processes, Corrosion Initiation, Test Methods, and Prediction Models, Road Directorate, 1020 Copenhagen, Denmark, 1996, p. 102.

[☆] Cem. Concr. Res. 32 (11) (2002) 1743–1753.

* Tel.: +39-422-881-350; fax: +39-422-881-332.

E-mail address: collepardi@encosrl.it (M. Collepardi).