

Discussion

Reply to the discussion by P.E. Grattan-Bellew of the review paper “Alkali–aggregate reaction in concrete containing high alkali cement and granite aggregate”^{☆,☆☆}

Zdzisława Owsiak*

Department of Civil Engineering, Technical University of Kielce, Al. Tysiąclecia P.P. 7, 25-314 Kielce, Poland

Received 19 July 2004; accepted 19 July 2004

I am very grateful to P.E. Grattan-Bellew for his interesting and thoughtful discussion of my paper. I appreciate his efforts to explain the course of the expansion curve, what enriches my experimental findings and what will be inspiration for further research. The hypothesis presented by P.E. Grattan-Bellew explaining the course of the linear expansion curve of concrete bars from the Fig. 2 of my paper is even more significant, as P.E. Grattan-Bellew noted simultaneous formation of the secondary ettringite accompanying AAR in concretes matured in field conditions.

Many authors report that AAR is often accompanied by the formation of the secondary ettringite; the cause of the effect is, however, still not explained [1–4]. In my experiment, the samples were not subject to influence of solution comprising external sulfates. The sulfates in the reaction originated only from the composites of the concrete. Also, the temperature of curing of the samples was low, taking into account that secondary ettringite forms as a rule in heat treatment with temperatures exceeding 70 °C [5,6].

References

- [1] V. Johansen, N. Thaulow, G.M. Idorn, J. Skalny, Simultaneous presence of alkali–silica gel and ettringite in concrete, *Adv. Cem. Res.* 5 (17) (1993) 23–29.
- [2] R.E. Oberholster, H. Maree, J.H.B. Brandt, *Cracked Prestressed Concrete Railway Sleepers: Alkali–Silica Reaction in Concrete*, London, 1992, p. 739.
- [3] M.D.A. Thomas, T. Ramlochan, Field cases of delayed ettringite formation, in: K. Scrivener, J. Skalny (Eds.), *Proc. Int. RILEM TC 186-ISA Workshop on Internal Sulfate Attack and Delayed Ettringite Formation*, Villars, Switzerland, 2002, pp. 85–97.
- [4] Z. Owsiak, The alkali–silica reaction in concrete, ceramics, *Pol. Ceram. Bull.*, Kraków 72 (2002).
- [5] S. Diamond, Delayed ettringite formation—a current assessment, in: K. Scrivener, J. Skalny (Eds.), *Proc. Int. RILEM TC 186-ISA Workshop on Internal Sulfate Attack and Delayed Ettringite Formation*, Villars, Switzerland, 2002, pp. 178–194.
- [6] W. Kurdowski, Delayed ettringite formation in case of some untypical cements, in: W. Kurdowski, M. Gawlicki (Eds.), *Proc. Int. Kurdowski Symp.*, Kraków, Poland, 2001, pp. 139–157.

[☆] DOI of original article 10.1016/S0008-8846(02)00789-5.^{☆☆} *Cem. Concr. Res.* 34 (1) (2004) 7–11.

* Fax: +48 41 34 43 784.