Cement and Concrete Research 41 (2011) 679–695

Contents lists available at ScienceDirect

Cement and Concrete Research

journal homepage: http://ees.elsevier.com/CEMCON/default.asp

Thermodynamics and cement science

D. Damidot [a,b,*], B. Lothenbach [c], D. Herfort [d], F.P. Glasser [e]

[a] Université Lille Nord de France
[b] EM Douai, LGCgE-MPE-GCE, Douai, France
[c] Empa, Lab. Concrete & Construction Chemistry, Dübendorf, Switzerland
[d] Cementir Holding, Denmark
[e] Chemistry Department, University of Aberdeen, Aberdeen, UK

ARTICLE INFO

Article history:
Received 16 January 2011
Accepted 28 March 2011

Keywords:
Thermodynamic calculations (B)
Blended cements (D)
Fly ash (D)
$CaCO_3$ (D)
Solubility constant

ABSTRACT

Thermodynamics applied to cement science has proved to be very valuable. One of the most striking findings has been the extent to which the hydrate phases, with one conspicuous exception, achieve equilibrium. The important exception is the persistence of amorphous C–S–H which is metastable with respect to crystalline calcium silicate hydrates. Nevertheless C–S–H can be included in the scope of calculations. As a consequence, from comparison of calculation and experiment, it appears that kinetics is not necessarily an insuperable barrier to engineering the phase composition of a hydrated Portland cement. Also the sensitivity of the mineralogy of the AFm and AFt phase compositions to the presence of calcite and to temperature has been reported. This knowledge gives a powerful incentive to develop links between the mineralogy and engineering properties of hydrated cement paste and, of course, anticipates improvements in its performance leading to decreasing the environmental impacts of cement production.

Contents

* Corresponding author at: EM Douai, LGCgE-MPE-GCE, Douai, France.
E-mail address: damidot@ensm-douai.fr (D. Damidot).

0008-8846/$ – see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.cemconres.2011.03.018