Editorial

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This issue of *Advances in Cement Research* contains papers dealing with several of the challenges facing cement science in the near future: the characterization in hardened conditions of concrete mixes; durability-related parameters; fabrication of low embodied-carbon materials, researching the basic hydration kinetics required to understand the differences of the new generation of blended cements; and the encapsulation of heavy metals in cementitious matrices.

Regarding the content of each paper selected:

- ‘Effectiveness of micro phases of water/cement ratio’ (Ozturk, 2013). This paper deals with the determination of the water–cement ratio (w/c) through the volumetric proportions of anhydrous, hydrated and voids of cement pastes obtained by scanning electron microscopy (SEM). The microscope w/c determination, so important for practical reasons, is also of interest for the systematic study of the cements with mineral additions. The proposed method has the advantage of not needing the preparation of thin sections, but only SEM analysis.
- ‘Hydration mechanism of tricalcium silicate (alite)’ (Noor-ul-Amin *et al.*, 2013). A review of the hydration of alite with reference to its stages and mechanism, this paper addresses the basic aspects of its cement chemistry. The hydration process is described in the four classical stages: period of initial reaction, period of slow reaction, acceleration period and deceleration period. The effect of the addition of calcium sulfate and calcium chloride is also commented upon.
- ‘Utilisation of gyrolite with impure Cd^{2+} ions in cement stone’ (Eisinas *et al.*, 2013) and ‘Inertisation of Cd^{2+} ions by using blended cement pastes’ (Hekal *et al.*, 2013). Here, two papers deal with the treatment of the heavy metal cadmium, one highly detrimental to human health. The first study addresses its inertisation and susceptibility of leaching when present in the concrete mix; the second study investigates the adsorption capacity of gyrolite for cadmium ions in acidic and alkaline solutions.
- ‘Strength development of optimised cementitious materials containing fly ashes and silica fume’ (Al-Nageim *et al.*, 2013). This is a very interesting paper relating the production of low embodied carbon cements. The use of ternary blends activated by water and by alkaline solutions is a good case-study example. The mix of different types of fly ashes together with silica fume gives reasonable compressive strength without the need for cement clinker.
- ‘Effect of alkalis on the mineral formation and properties of

alite-sulfoaluminate cement’ (Liu *et al.*, 2013). This paper also addresses the effects on mineral formation of alite-sulfoaluminate cement clinker and its properties using limestone, fly ash, clay and gypsum as raw materials. The presence of alkalis affects the formation of $\text{C}_4\text{A}_3\bar{\text{S}}$, C_3S , the setting time and the early strength of cement.

- ‘Properties of alinite cement produced by using soda sludge’ (Kesim *et al.*, 2013). Alinite cement, first described more than 25 years ago, meets contemporary demands for low clinker-content cements. This study describes how industrial wastes can be used as raw materials.
- ‘Pozzolanic reaction rate of fluid catalytic cracking catalyst residue (FC3R) in cement pastes’ (Payá *et al.*, 2013). Within the scope of the use of industrial wastes, the final paper in this issue deals with the pozzolanic properties of FC3R (a waste material generated in the petroleum industry). The pozzolonicity is studied through the measurement of the reacted lime by gram of catalyst and through the study of the progression of the FC3R reacted with hydrochloric acid treatment. The objective is to optimise mix proportions.

The papers in this issue represent basic research that has an immediate practical application, a frequent characteristic of studies published in *Advances in Cement Research*. The challenge of producing new types of cement with low clinker content that are practical, economically viable and durable can only be achieved through basic and comprehensive research. Advances in this area seldom appear by chance – systematic basic research will always sustain reliable progress. Radical changes in the natural and economic environment are being noticed now by mainstream society. Security can be found in the knowledge that researchers worldwide are working to develop new types of materials to meet future challenges. One of the roles of a publication like *Advances in Cement Research* is to assure the quality of the work published and to present it in a structured manner, aimed at promoting advances and innovation.

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