Editorial

F. P. Glasser

Professor, Department of Chemistry, University of Aberdeen, Aberdeen, UK

The start of a new year gives me the opportunity to send best wishes to our readership for 2017.

The first issue of the year continues a well-established trend in cement science, to characterise the product (Portland cement) and continue to improve its functionality by means of additives.

Rakhimov and colleagues (2017) explore the effect of polyminerall clay on the properties of fresh and hardened cement. The success of thermally treated kaolin as an admixture has been limited in part by the availability of the precursor (kaolin), its poor geographic distribution, and competition from other uses (e.g. papermaking). The authors show that potential exists to activate mixed layer clays, and that the mineral impurities, such as quartz feldspar and illite, also influence product properties; both physical and chemical reactions occur between heated impure clay and cement. This is a fertile field and a growing research area as the industry seeks to lower the carbon dioxide (CO₂) footprint of cement production by means of mineral admixes.

Chen and colleagues (2017) report on a novel synthetic pozzolan made by reacting carbide slag with fine-grained quartz tailings. In the course of thermal treatment at approximately 1050°C, the quartz grains develop a micron-thick adherent envelope of belite. The resulting composite grains, mixed with Portland cement, are reactive owing to hydration of the belite coating. Although compressive strengths decrease slightly compared with uncoated tailings, the microstructure is improved especially by densification of the interfacial transition zone. Autogenous shrinkage is also reduced using coated grains.

Gupta and colleagues (2017) show that relatively simple routes exist whereby the properties of lignosulfonate (LS) plasticisers can be improved by grafting LS with polyethylene oxide. The new molecular structures thus created are elucidated and the impact on fresh cement mixes is demonstrated through zeta potential and spread measurements. It is apparent that the underlying science of cement–organic interactions is

sufficiently well developed to design molecular configurations that will, in turn, achieve new functionality for fresh pastes and improve the workability.

He and colleagues (2017) describe a method for low temperature, approximately 500°C, preparation of ‘ferrite’, tetracalcium aluminoferrite, C₄AF. The Ca, Al and Fe components are mixed as water-soluble nitrates in urea solution. Evaporation of the homogeneous solution yields a homogeneous solid, which upon heating to approximately 500°C, undergoes spontaneous ignition. The strongly exothermic nature of reaction generates a pulse of heat evolution that briefly attains approximately 1000°C; subsequent annealing at approximately 500°C allows formation of well-crystallised ferrite. This process obviates need for high-temperature furnaces and lengthy sintering.

In other matters, a call for papers will be issued shortly for a special ICE publication ‘Nanomaterials in Construction’. The website for the next ICCC, to be held in Prague in 2019, is now open (see www.iccc2019.org). Programme planning has been begun and I am sure that suggestions for plenary speakers and special topics will be considered.

REFERENCES

- Chen D, Deng M, Mo L and He Z (2017) Influence of modified quartz tailing on strength and autogenous shrinkage of cement pastes. *Advances in Cement Research* **29(1)**: 11–20, <http://dx.doi.org/10.1680/jadcr.16.00065>.
- Gupta C, Perkins KM, Rios RT and Washburn NR (2017) Poly(ethylene oxide)-grafted lignosulfonate superplasticisers: improving performance by increasing steric interactions. *Advances in Cement Research* **29(1)**: 2–10, <http://dx.doi.org/10.1680/jadcr.16.00075>.
- He Z, Li Y and Shao Y (2017) Low temperature synthesis of C₄AF by self-propagating combustion reaction. *Advances in Cement Research* **29(1)**: 33–43, <http://dx.doi.org/10.1680/jadcr.16.00078>.
- Rakhimov RZ, Rakhimova NR and Gaifullin AR (2017) Influence of the addition of dispersed fine polymineral calcined clays on the properties of Portland cement paste. *Advances in Cement Research* **29(1)**: 21–32, <http://dx.doi.org/10.1680/jadcr.16.00060>.