Can superabsorbent polymers mitigate shrinkage in cementitious materials blended with supplementary cementitious materials?

A promising way to mitigate autogenous shrinkage in cementitious materials with a low water-to-binder ratio is internal curing by the use of superabsorbent polymers. Superabsorbent polymers are able to absorb multiple times their weight in water and can be applied as an internal water reservoir to induce internal curing and mitigation of self-desiccation. Their purposefulness has been demonstrated in Portland cement pastes with and without silica fume. Nowadays, fly ash and blast-furnace slag containing binders are also frequently used in the construction industry. The results on autogenous shrinkage in materials blended with fly ash or blast-furnace slag remain scarce, especially after one week of age. This paper focuses on the autogenous shrinkage by performing manual and automated shrinkage measurements up to one month of age. Without superabsorbent polymers, autogenous shrinkage was reduced in cement pastes with the supplementary cementitious materials versus Portland cement pastes. At later ages, the rate of autogenous shrinkage is higher due to the pozzolanic activity of the supplementary cementitious materials. Internal curing by means of superabsorbent polymers is successful, independent of this long-term higher rate of shrinkage in mixtures with supplementary cementitious materials. Superabsorbent polymers proved to be successful in mitigating self-desiccation.