

AUSE PhD Thesis Award

Advanced Quantitative Synchrotron X-ray Imaging of Cement Micro- and Meso- Structures #162

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This research includes observations on hydration kinetics, microstructural changes and the effect of curing temperatures on cement properties. It also investigates the development of innovative methods for measuring cement hydration in situ, with the aim of improving the understanding and optimising the use of cementitious materials. The 4D (3D+time) tomographic study was reported with an astonishing spatial resolution of 250 nm and excellent contrast between the different components. The hydration of alite particles, the formation of C-S-H gel shells surrounding every alite grains and the passage of water through these shells were observed in the tomograms. Many interesting features have been identified in this 4D multi-modality X-ray imaging study, from laboratory micro tomography to synchrotron phase contrast and synchrotron ptychographic nanoimaging; such as spatial dissolution rate of anhydrous particles, etch-pits growth rate of alite particles, C-S-H gel shell growth rate, etc.