In-situ observation of cement pastes microstructures

The objective of this research is to make in-situ observations on fresh cement paste microstructures by using a conventional SEM during setting and to understand the physical growth in cement particles and different phases at early age for different mixtures qualitatively and also quantitatively.

Methodology:
Advanced scanning electron microscopy technique - Quantomix wet SEM technology

Sample preparation:
1. Preparing multi-well plate for QX-capsule
2. Applying sample via conventional pipetting
3. Quick sealing the QX-capsule
4. Placing the QX-sample in SEM chamber

SEM image analysis: Thresholding

Volume fraction (Area fraction):

Single particle growth

Conclusions
1. Using Quantomix capsuling system, the physical changes in microstructure of fresh cement pastes can also be studied easily.
2. In general an increment of 14-25% in cement particle’s diameter is observed at age of 6 hours after mixing the cement paste.
3. Due to the less intensity of the cement particles, among the three mixtures, the hydration rate is more for w/c = 0.7 mixture.
4. For all mixtures at initial setting time approximately 50% reduction in its original water content is observed, which can help in prediction of setting times at microstructural level for fresh cement pastes.