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## Density mapping of hardened cement pastes using X-ray ptychographic nanotomography - pilot experiment

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X-ray ptychographic nanotomography -as recently developed at the cSAXS beamline- allows for non-destructive, three-dimensional mapping of the electron density. Its proven quantitiveness combined with the sub-micrometre resolution makes it a suitable tool for the assessment of densities of the individual phases in complex materials, such as hardened cement pastes.

Here we present results of a pilot experiment performed on a cylindrical sample of epoxy-impregnated hardened cement paste of about 30  $\mu\text{m}$  in diameter. Two-dimensional cross-sections of the three-dimensional electron density map show a microstructure that bears distinct similarity to that observed by the high-resolution scanning electron microscopy. Domains of various residues of clinker grains, calcium hydroxide, calcium silicate hydrates, epoxy-resin-impregnated porosity and unimpregnated porosity are revealed and are manifested as distinguishable peaks in the histogram of the three-dimensional electron density map. On assumptions of (a) the chemical composition, (b) the purity of the analyzed regions, the mass densities of the above mentioned individual material phases are estimated.

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