Non-destructive 3D imaging of building materials using X-ray microscopy

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ABSTRACT
X-ray microscopy (XRM) can be applied to non-destructive 3D imaging of building materials over a range of length scales. On the large end of the spectrum, XRM at 160 kV accelerating voltage was applied to image an intact 8” core sample. The sample was known to contain numerous foreign objects and defects of various density. These foreign objects were initially detected when imaging a large field of view at 90 µm voxel size, and higher resolution information was then acquired on selected regions of interest at 66 and 70 µm voxels to characterize the structure in greater detail.

On somewhat smaller samples (on the order of few cm in size), the transmission of lower kV X-rays affords the opportunity to distinguish small differences in material density. The various phases of the concrete matrix can then be reconstructed, segmented, and quantified. Furthermore, recent improvements in XRM capability through new X-ray source designs and advanced iterative reconstruction methods mean these scans can now be performed in a fraction of the time – enabling the collection of more datasets and improved statistics, as well as opening the door to more possibilities of in situ experiments [1,2].

REFERENCES