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Characterization of self-healing concrete by X-ray microtomography

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Self-healing strategies are regarded as a promising solution to reduce the high maintenance and repair cost of concrete infrastructures. In the present research, focus is posed on autogenous and engineered self-healing in steel fiber reinforced concrete (SFRC). The tensile behavior of the two different mixes, differing by the presence of the crystalline admixtures, has been investigated after a series of precracking and a water immersion conditioning cycle. Specimens were pre-cracked up to a crack width of 0.25mm; then, they are healed for three months in water. To assess microstructure evolution during healing, recourse is made to high resolution X-ray computed microtomography (X-ray microCT), to be repeated before and after water immersion.

During last years, X-ray microCT has been widely applied as a nondestructive technique allowing for a micrometer resolution within the bulk (du Plessis, 2014; Fedele, 2013; Fedele, 2014; Vicente, 2014; Wang, 2014; Yuan, 2016). As a novelty, herein the CT scan has been used to determine the position and orientation of the steel fibers in SFRC specimens, to analyze diffused damage and discrete fractures within the SFRC specimen after the pre-crack test, see Figure 1. Further developments will concern the assessment of porous distribution within the concrete matrix and their connection degree (Figure 1).

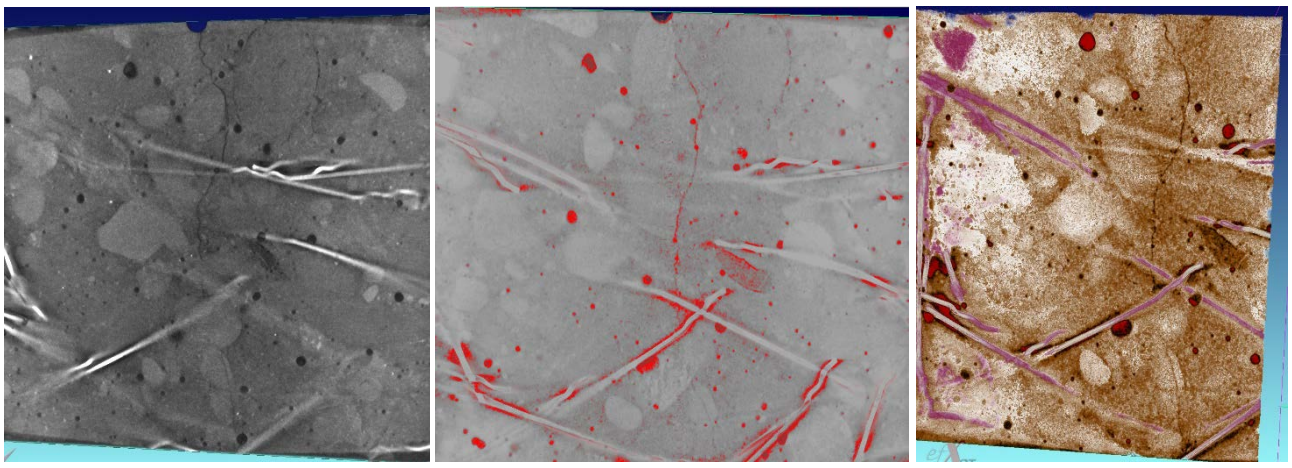

Figure 1. Computed tomography views of the spatial distribution of the crack, fibers, pores and aggregates.

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