

3D printing and self-healing concrete: a good match?

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Abstract. Self-healing concrete has shown excellent potential in improving the durability of (reinforced) concrete structures and reducing the need for their repair and maintenance. This has been further substantiated by several successful full-scale demonstrator projects. Nevertheless, industrial uptake of the technology is lagging behind, mainly due to the higher initial cost compared to traditional concrete. In addition, it is well known that some self-healing mechanisms can have detrimental effects on properties of concrete, such as e.g., the compressive strength, making some engineers sceptical about practical applicability. With these two issues in mind, one might wonder: shouldn't we simply apply self-healing concrete only where it is needed? This has been done in the past in so-called hybrid structures, in which self-healing concrete was used in the cover zone as a stay-in-place mold, while traditional concrete was used as infill. Additive manufacturing (3D printing) techniques offer additional possibilities in selective placement and optimization of self-healing concrete composites. Additive manufacturing provides unprecedented freedom in design and optimization of structures at virtually no additional cost. This could allow customizing the placement of self-healing agents based on structural design and loading considerations of a given structure. In this talk, recent developments and potential applications of different additive manufacturing techniques for design and fabrication of self-healing concrete will be discussed.

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