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Modelling the Self-Healing Potential of Dissoluble Encapsulated Cement

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In its fresh state, cementitious systems can be considered as collide suspensions build up from a mineral particles that follow a predefined grading. In this paper, a modelling approach that shows the healing potential of a blended cementitious system will be provided that consists of original cementitious particles mixed with so-called Dissoluble Encapsulated Particles (DEP). The DEP particles are represented by a range of predefined fractions of original cementitious particles, but with its surface covered with a thin dissoluble membrane. The self-healing principle of this system is based on the most basic healing process, where a delayed hydration of the DEP fractions may occur initiated by a crack. The crack cause the membrane to dissolve and exposes the still unhydrated DEP particles to water, after which the delayed hydration of the DEP system will take place, while closing the crack. The proposed model will demonstrate the healing potential of DEP inside a concrete and analyse the most dominant parameters affecting the mechanism. The membrane is considered to dissolve in high pH-conditions, or whenever being exposed to air in case of a crack. The results show the potential of the healing mechanism to bridge a certain crack width, and shows, which fractions of a regular cement should be, replaced in order the DEP system being most efficient. The results show that multi fraction DEP systems are more efficient then single fraction DEP, and that the addition of DEP does not affect the properties but may lead to a delay in the property development of cementitious systems.

REFERENCES

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