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Leaching effect on mechanical properties of cement-aggregate interface

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Abstract

This study concerns the characterization of the mechanical properties of the cement paste and of the cement-aggregate interface in the degraded state by a chemical leaching mechanism. This study is carried out within the framework of the MIST laboratory. The experimental tests were carried out on cement paste and composites consisting of aggregates bound by the same cement paste prepared with a water/cement ratio of 0.5. The particular experimental devices, designed and produced for the purposes of this study, made it possible to directly solicit the composites at the cement-aggregate interface. As the process of leaching with the deionised water occurs very slowly, the experimental study is accelerated in the laboratory by replacing water by ammonium nitrate solution. To quantify the development and kinetics of chemical degradation at the cemented bond, the concrete leaching fronts are characterized at different times of degradation by using phenolphthalein. The local mechanical tests (tensile and shear) are performed on cement paste and composite at different degradation rate. The experimental results show a fast drop in shear or tensile strength of about 45% at the beginning of degradation. These results confirm the effect of the cement paste-aggregate interface degradation on the mechanical properties.

Keywords: Cement paste, Cement-aggregate interface, Chemical degradation, Leaching, Tensile test, Shear test, Local scale.

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