

Demolition waste potential for completely cement-free binders

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Due to renovation and fighting in the world, a huge accumulation of construction and demolition waste is formed. These materials are effectively used as aggregates, but there is very little information about the use of scrap concrete to create cementless binders. The purpose of the work is a comprehensive study of the composition and properties of concrete wastes of various fractions with the aim of their rational use as cementless binders. The scientific novelty lies in the fact that the nature of the processes of structure formation of a cementless binder based on sandy fractions of the screening of fragments of destroyed buildings and structures, as a complex polyfunctional system, has been theoretically substantiated and experimentally confirmed. Different percentages of non-hydrated clinker minerals in concrete scrap were determined. In the smallest fraction (less than 0.16 mm), more than 20% of alite and belite are present. Waste of the old cement paste is more susceptible to crushing compared to the large aggregate embedded in it, therefore, particles of the old cement paste and fine aggregate predominate in the finer fractions of the waste. Comprehensive microstructural studies have been carried out on the possibility of using concrete scrap as a completely cementless binder using scanning electron microscopy, X-ray diffraction analysis and differential thermal analysis. It has been established that for cementless samples prepared from the smallest fractions (less than 0.315 mm), the compressive strength is 1.5-2 times higher than for samples from larger fractions. This is due to the increased content of clinker minerals in their composition. The compressive strength of the cementless binder after 28 days (7.8 MPa), as well as the early compressive strength at the age of 1 day after steaming (5.9 MPa), make it possible to effectively use these materials for enclosing building structures.