

Creep and Shrinkage Behavior of Disintegrated and Non-disintegrated Cement Mortar

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Abstract:

In the past decade, one of the essential concerns in the construction community has been human impact reduction in the environment. As Portland cement is one of the most popular building materials globally, it is accountable for up to 8% of global CO₂ emissions yearly. One way to reduce these carbon emissions from cement manufacturing is to reuse old cement.

As it happens in the construction site, materials are ordered considering waste factors. When the work at the construction site is over, then the contractor has some material left that can be sold or stored for other jobs. But throughout the time, it is possible that the shelf life or the recommended time of cement is over and must be utilized.

One way to prevent the cement from ending up in landfill after its shelf life is to regain its activity and reuse it as a binder. As it has been discovered, the milling by planetary ball mill is not effective. Grinding by collision is considered a more efficient way to refine brittle material and, in the case of cement, to regain its activity.

In the past few decades, there has been a considerable amount of research regarding the partial replacement of cement using disintegrated cement in cement mortar or concrete. In this article, the creep and shrinkage properties of cement mortar specimens made from old disintegrated, old non-disintegrated, and new non-disintegrated Portland-cement are determined and compared.

The tests show that the creep strains for old disintegrated and old non-disintegrated cement mortars are close and very similar – within a 2% margin respectively. Still, the creep strains for new non-disintegrated cement mortar are 30% lower. Shrinkage for old disintegrated and old non-disintegrated cement mortar is up to 20% lower than to new non-disintegrated cement mortar. The research shows that disintegration is a viable procedure to make old cement suitable from a long-term property standpoint for structural application