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# Influence of Surface Treatment of Fresh Concrete on its Resistance to Drying Shrinkage

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## 1 Introduction

The fundamental part of the structural concrete is Portland cement, which exhibits hydraulic properties and sufficient mechanical and also durability performance. There is number of various types of cements, that are based on Portland clinker, however these cement types were primarily developed for the specific applications. These technologies often lead to the supressing of specific technological steps, such as curing. Portland cement based concrete is hydraulic material, which is sensitive for the sudden loss of moisture during hydration (Vinkler and Vítek, 2019). Surface treatments in form of thin films are applied to prevent the drying of concrete after its casting, because hardened mass of concrete significantly reduces its diffusivity. The quality of surface layer of concrete is crucial in relation to the durability, because this thin part of structure determine final resistance to the impact of external environment. The deterioration of the concrete "skin" during hardening is the most frequent reason of the damage during structure operation.

## 2 Experimental Program

Conducted experimental program was focused on the evaluation of the quality of concrete surface layer, of which properties were modified by the application of surface treatment to prevent sudden evaporation of the moisture. This technology is used during the production of concrete pavement by the roller, and also after production of continues concrete guardrails. CEM I 42.5 (SC) is a specific type of Portland cement, which is produced for the utilization for the construction of road pavement and transport structures. Its significant feature is low content of $C_3A$ and lower value of specific surface by Blaine (Davidová and Reiterman, 2020). CEM II 32.2 B-S performs cement with the content of blast furnace slag, which stand out from low hydration heat, low shrinkage and long-term evolution of mechanical properties.

## 3 Results and Discussion

Obtained results of the loss of the moisture of all sets of samples are introduced in Figure 1. It is evident, that reference and treated samples are very sensitive for the evaporation of the water during initial hours of the hardening, where the effect of the treatment is very low.

The measurement of shrinkage declared, that mortar made of CEM I 42.5, which is specially

prepared for transport structures, treated by surface agent is well resistant to the cracking. The remaining set of samples cracked approximately after 30 days of drying. However, it is necessary to note, that the time of rupture is dependent on the organization of the test. Only upper surface was exposed to the drying, what significantly extended the rupture time. Previous experiment declared, that in case of three-side drying, the rupture time could achieve a few days.

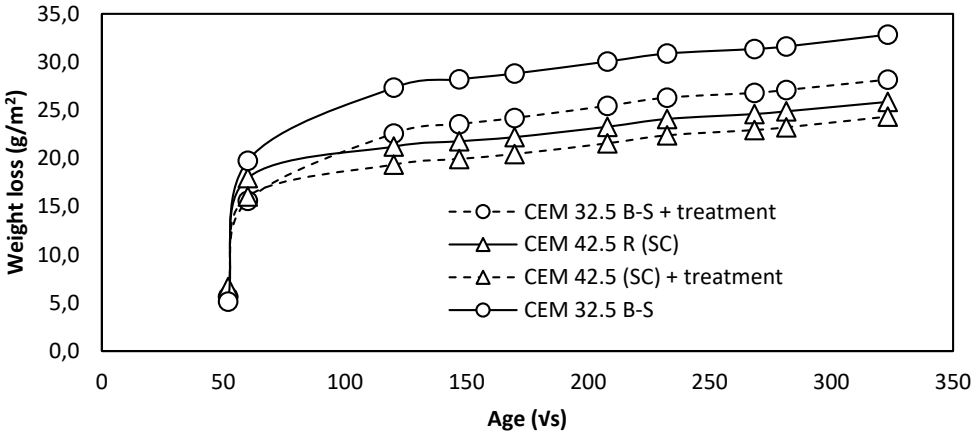


**Figure 1**. Monitored loss of the moisture in time.

## 4 Conclusions

The program conducted on standard cement mortars declared, that blended binding systems are prone to loss of the moisture. In addition, blended cement exhibited higher tendency to cracking in terms of restrained shrinkage test, the studied surface treatment did not improve this property as well. Achieved results confirmed the improvement of water impermeability, however short-term water adsorption was nearly similar for all sets of samples, except of samples made from road cement, which were treated on their surface, they exhibited slightly lower permeability of the surface layer.

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