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# Plaster Mortar

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## Introduction

The granite industry produces a nuisance waste called granite powder. In its loose state, it poses a hazard to humans and the environment. The main objective of this study was to determine whether the waste granite powder can be safely used in cement-lime plaster. First, the best-predicted percentage of the additive in the finished plaster mortar was determined, which ranged from 5 to 10%. A reference test was also performed to compare the results. The prepared samples were then subjected to fresh mix properties and cured composition evaluation. In the final stage, analysis of the results showed that the 10% addition of granite powder resulted in a significant improvement in the strength parameters of the mortar. Particularly noteworthy was the improvement in the peel strength parameter for silka substrates, which is the superior parameter tested in plasters.
In conclusion, it was observed that the addition of waste granite powder improves the mechanical properties of cement-lime plasters. The use of granite powder in the production of cement-lime materials will reduce the amount of material deposited in landfills. It will also reduce the proportion of cement in the mixes while maintaining the same or even better parameters, which in the long run will lead to a reduction in $CO_2$ emissions by the cement industry. An economic analysis has shown that the use of granite powder can also reduce the price of the final product. This solution is beneficial for the environment and human health, as well as economical.

**Study on the effect of granite powder addition to cement-lime plaster mortar:**

- Two types of samples were prepared (Figure 1) with different amounts of addition
- Tests were carried out on fresh plaster mix (volumetric density, consistency)
- Tests on hardened mortar /after 28 days/ (compressive strength, bending tensile strength, pull-off strength and water absorption)

*The samples were stored in a humid environment.*


**Fig. 1** Specimens **a)** rectangular 40x40x160mm **b)** on substrates made of masonry elements

**Fig.2** Schematic of the test stand with TERMOton pull-off force measuring device

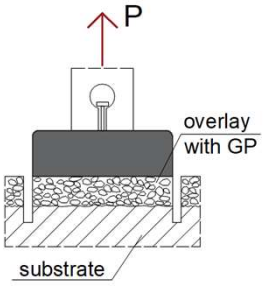


**Fig.3** Cross-section through the plaster mortar during pull-off test

## Results

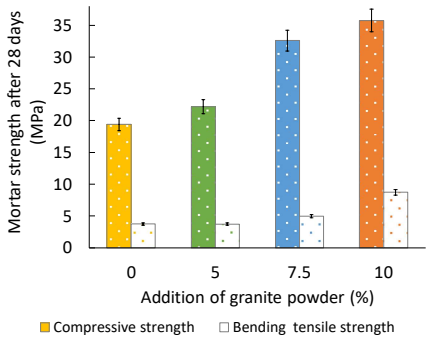


**Fig.4** Bending tensile strength and compressive strength after 28 days (MPa)

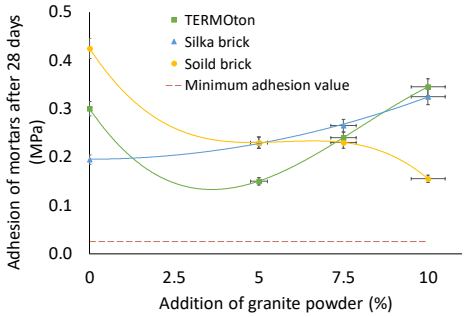


**Fig.5** Change in adhesion of hardened mortars to the substrate with respect to the type of substrate and the amount of granite powder added

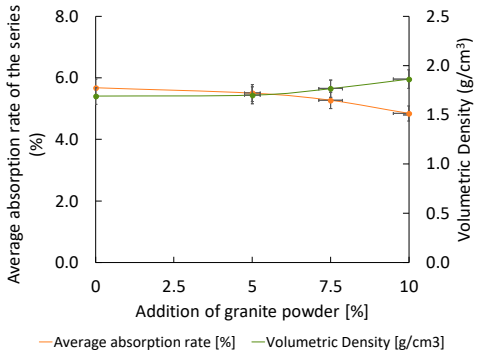


**Fig. 6** Relation of bulk density to mean absorbability of a series

## Conclusions

For cement-lime plaster mortar 10% granite powder addition was obtained:

- 84.33% increase in average compressive strength compared to the reference sample (from 19.4 MPa to 35.75 MPa)
- an increase in average bending tensile strength by 133.33% compared to the reference sample (from 3.75 MPa to 8.75 MPa)
- average adhesion strength to silicate brick 0.325 MPa, in control sample without granite powder addition 0.195 MPa was obtained;
- the average strength of adhesion to clay brick 0.345 MPa, in the control sample without granite meal addition a value of 0.3 MPa was obtained;
- a decrease of water absorption coefficient,,c'' (from 0.640 [-] in the control sample to 0.560 [-] for the sample with the additive).

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## References

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