The effect of the addition of granite powder to the primer on the pull-off strength of epoxy resin coatings

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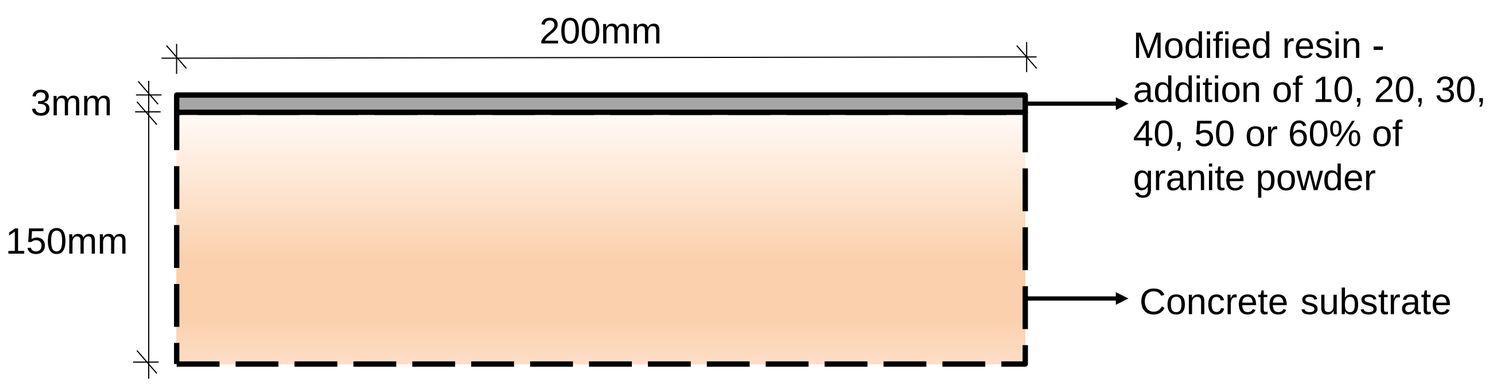
Introduction

Currently, there are many attempts to increase the pull-off strength of epoxy coatings. This can be, for example, achieved by appropriate treatment of the surface of a concrete substrates, such as surface mechanical treatment or texturing [1]. In the authors opinion, a simpler method is the modification of the composition of the resin. There are some examples in this regard. These examples include the addition of SiO2, graphene, natural fibers, and granite powder [2, 3]. Currently, there are no studies on the modification of the base with granite powder. Currently, there are no studies on the modification of the base with granite powder.
In the tests, the ground was modified with granite powder in an amount from 10% to 60% in relation to the weight of the resin. A reference sample was also made to compare the obtained results. The pull-off strength of the epoxy resin coating was tested for each configuration and the results were compared with a reference sample. The highest pull-off strength of the coating was observed for the base with the addition of 20% granite flour (an increase of 18% compared to the reference sample).

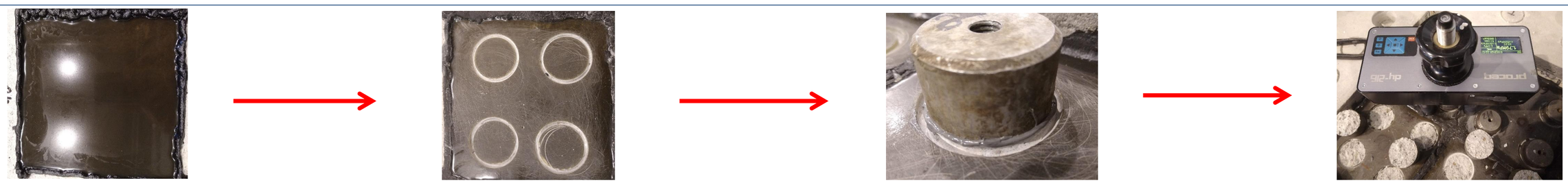
Description of the study



The test began with the preparation of the substrate, made of C30 / 37 concrete, S3 consistency, supplied by a specialized company. After its full hardening, the surface was ground and degreased. The resin used consisted of two components: A and B. After the first component was measured out, a measured amount of granite powder was added. After mixing, component B was added and mixed again. The modified resin was then applied to the substrate to obtain a 3mm layer.

The study examined the effect of adding 10%, 20%, 30%, 40%, 50% and 60% of granite powder to the epoxy resin layer.

Results



Resin-flooded sample — Drilling holes for discs — Sticking discs — Adhesion test

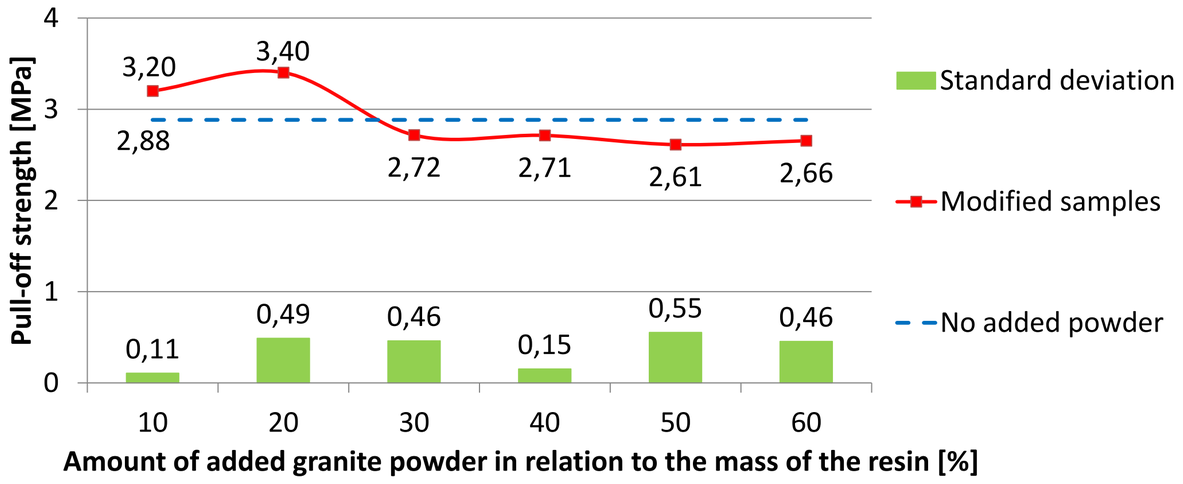


Fig. 1. The dependence of the strength on the amount of granite powder added

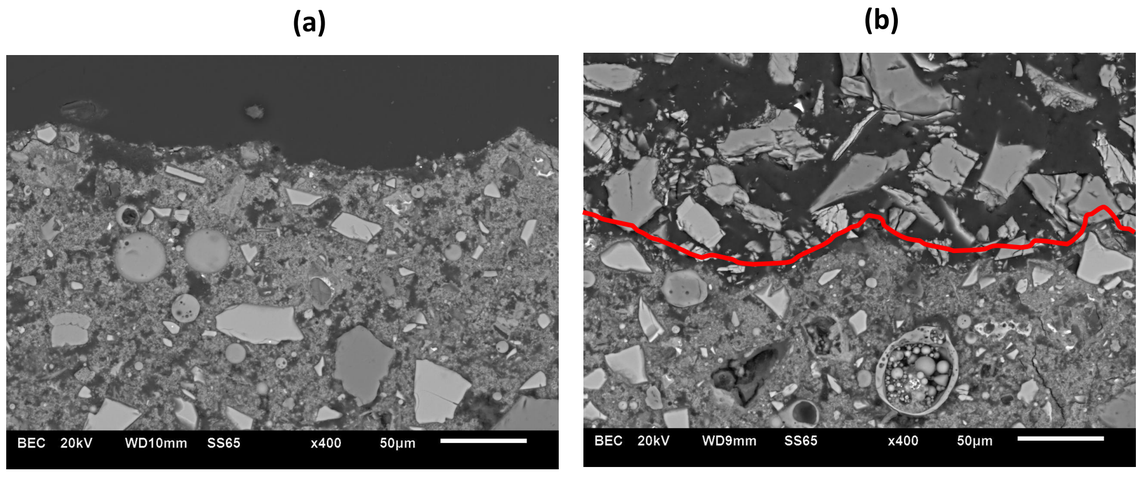


Fig. 2. Photo of the near-surface zone: (a) reference sample, (b) modified sample (20% granite powder)

Conclusions

The highest pull-off strength of the coating was observed for the substrate with the addition of 20% granite flour, which obtained the result of 3.40 MPa (an increase of 18% compared to the reference sample - 2.88 MPa). The second best result was the addition of 10% granite powder (increase by 11%). In Fig. 2b, you can see the individual granite powder grains perfectly surrounded by the resin, thanks to the sharp edges and the rough surface of the flour (good cohesion).
Due to the low cost of granite powder, this study showed that we can easily reduce the cost of making the resin coating, while increasing the pull-off strength.

References
[1] K. Krzywiński, Ł. Sadowski, Coatings, 9, 143 (2019)
[2] S. Pourhashema, M. Vaezia, A. Rashidib, Surf. Coat. Technol., 311, (2017)
[3] B. Madhusudhan, R. Meenakshi, D Madhu Sudan, N. Ananthakrishna P. Venkateshwar, Advances in Materials and Processing Technologies, (2017)