

# Mechanical properties of epoxy adhesives modified with waste quartz powders

**Agnieszka Chowaniec, Sławomir Czarnecki, Łukasz Sadowski**

agnieszka.chowaniec@pwr.edu.pl

Wroclaw University of Science and Technology, Faculty of Civil Engineering, Wroclaw, Poland



## Introduction

The search for applications for waste mineral powders as fillers for building materials is becoming more and more popular [1]. Its due to the increasing potential of recycling these powders, reducing waste in heaps, and reducing the price and carbon footprint of building materials itself. As shown in previous studies [2], the use of waste quartz powders as a filler of an epoxy resin coating used as a floor coating did not adversely affect the adhesive properties of this coating on a concrete substrate. However, it is not known how the waste quartz powders affect the mechanical properties of the coating important for the floor, i.e. tensile and flexural strength. Thus, the main aim of this research was to investigate the effect of three types of waste quartz powders on the tensile and flexural strength of epoxy resin used as a floor coating.

## Materials and Methods

The tests were carried out on the epoxy resin reference mixture without filler and the epoxy resin mixtures with three selected waste quartz powders as fillers. The selected waste quartz powders had the same chemical composition but a different particle size distribution. For each powder, three mixtures containing by mass 7%, 19% and 29% of the powder were prepared. For each test five specimens were made. To assess the tensile and flexural strength (Fig. 1 a and b), the procedures specified in the PN-EN ISO 527-1: 2020-01 and PN-EN ISO 178: 2019-06 was used.

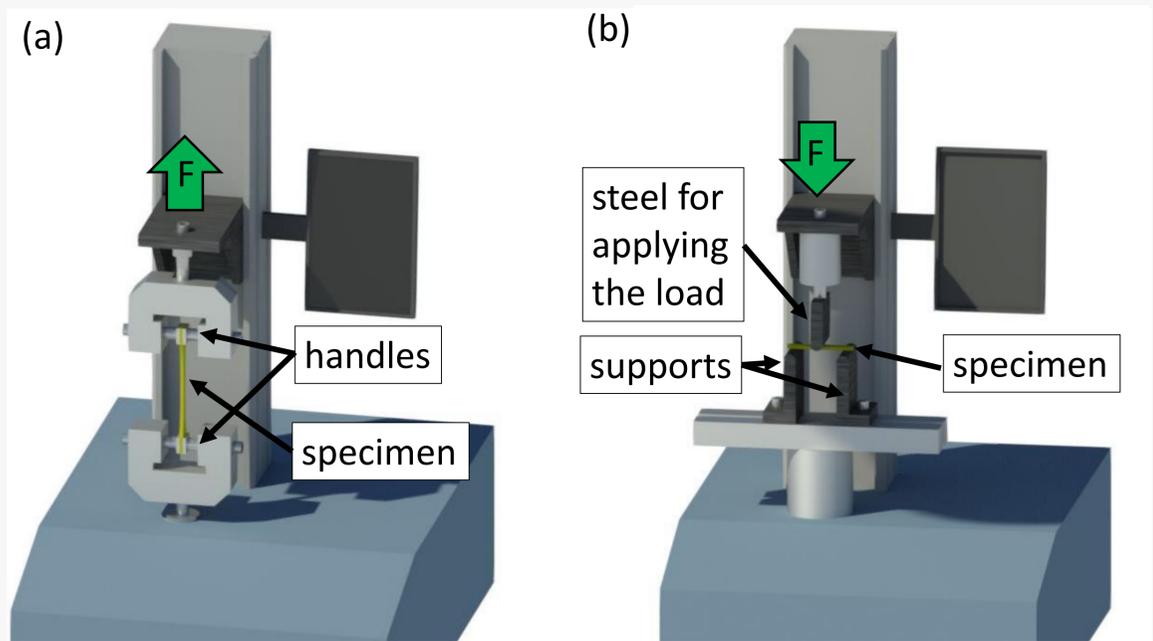


Fig. 1. View of the test stand: (a) tensile strength, (b) flexural strength.

## Results

The obtained average values of the tensile and flexural strength are shown in Fig. 2.

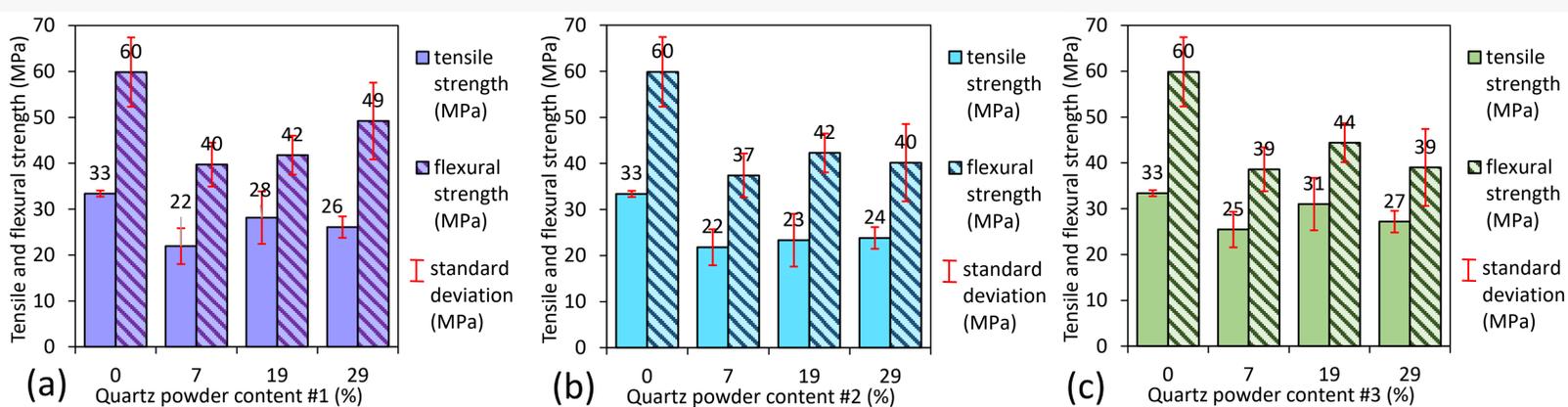


Fig. 2. The relation between the content of the waste quartz powders and the tensile and flexural strength of coating for: (a) powder #1, (b) powder #2, (c) powder #3.

## Conclusions

Tests showed that the quartz powders had a decisively negative effect on the tensile and flexural strength of the epoxy resin coating. The addition of quartz powders in the amount of 7% to 29% by weight in the coating caused a decrease in the tensile strength of the coating by 7-34%. In the case of flexural strength, the addition of quartz powders in the amount of 7% to 29% caused a decrease in strength by 17-37%. Therefore, additional tests are required to see if the reduction of the tensile and flexural strength deteriorates the durability of the epoxy resin coating.

## References

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