



## Epoxy-granite composite and its application

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### Novelty

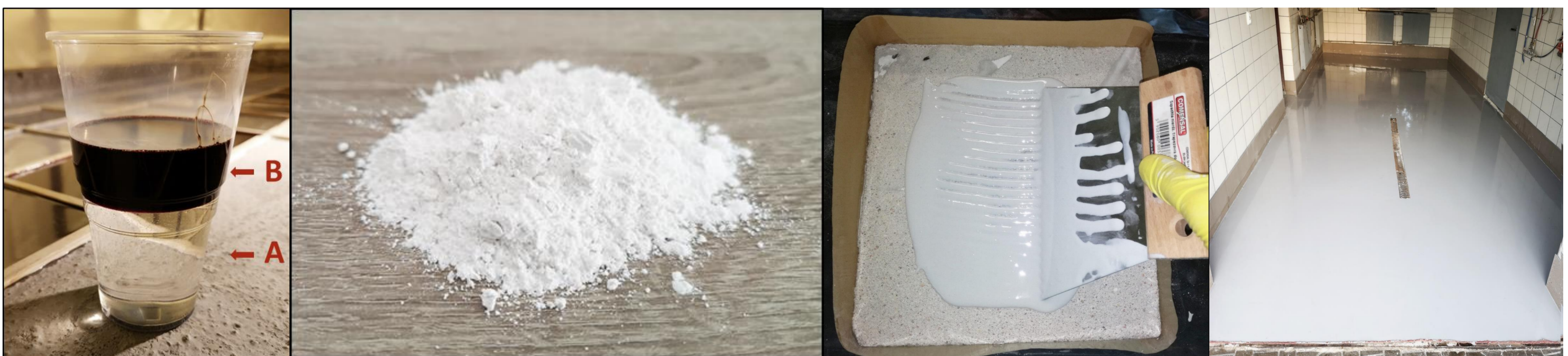
The novelty of the invention is the development of an environmentally friendly epoxy-granite composite. Epoxy resins are readily used as industrial floor coatings. Their share in the global flooring market is constantly growing. However, one cannot ignore the problem that they are one of the most toxic materials in the world, including: toxic to humans and animals, carcinogenic. On the other hand, waste from the extraction and processing of natural resources is problematic, as it accounts for more than 25% of all waste in Europe, and more than 36% in Poland, more than half of which is mineral waste. The invention focuses on solving both problems. The invention proved that it is possible to replace up to 30% of the mass of epoxy resin and hardener in the coating with waste granite powder, which allows to reduce the environmental impact of the product in the form of emitted CO<sub>2</sub> by 17%. The developed epoxy-granite composite allows for the recycling of granite waste, which makes it possible to reduce the amount of waste granite powder that is harmful to the environment, currently mainly deposited on heaps. It also lowers the toxicity of the coating by reducing the content of harmful components in it.

### Description

Epoxy composites for floor coatings are most often applied on a concrete or cement substrate. The surface of the substrate must be properly prepared by mechanical treatment (grinding, shot blasting or sandblasting) and thorough vacuuming. Then, a bonding agent should be applied to the surface of the substrate, and only on the prepared substrate, the epoxy composite coating can be applied. Epoxy coatings consist of two liquid components. The first component contains epoxy resin, and the second component is a hardener. Due to the durability of the epoxy composite coating, the average pull-off strength of the epoxy resin protective coating must be at least 1.5 MPa and the single results must be at least 1.0 MPa. The main advantage of epoxy composites used as floor coatings is resistance to acids and lyes, mineral oils, fuels, lubricants, sewage and seawater. The main disadvantage is the harmfulness to the environment of the components of epoxy composites before hardening. Numerous scientific studies have confirmed that the components of epoxy composites before hardening are toxic to aquatic organisms, irritate the skin and eyes, may cause skin allergic reactions, eye damage, allergy and asthma symptoms. Another disadvantage of epoxy composites is their high price compared to other building materials.

With the above in mind, the invention was developed, which is a composite consisting of epoxy resin and granite powder filler. The invention is applicable to the production of protective coatings and finishing layers for floors. The essence of the invention is an epoxy-granite composite containing three components A, B and C. Component A constitutes 47.6-61.7% by weight of the entire composite and contains, among others, maximum 65% epoxy resin based on bisphenol A and maximum 25% resin based on bisphenol F. Component B is a granite powder filler with a proportion of at least 90% of the grain size with a diameter below 63 μm, necessarily containing by weight 74.0-78.0% SiO<sub>2</sub>, 12.5-14.0% Al<sub>2</sub>O<sub>3</sub>, 0.2-0.4% Fe<sub>2</sub>O<sub>3</sub>, maximum 0.05% TiO<sub>2</sub>, 7.5-8.5% K<sub>2</sub>O + Na<sub>2</sub>O, maximum 0.5% MgO and a maximum of 0.5% CaO in an amount of 7.4-28.6% by weight of the total composition. Component C is a phenalkamine hardener in the amount of 23.8-30.9% by weight.

The use of a granite powder filler reduces the total demand for hardener and epoxy resin component by 7.4-28.6% by weight. As a result, the content of harmful and relatively expensive components in the epoxy-granite composite decreased by 7.4-28.6% by weight. The epoxy-granite composite according to the invention is convenient to use and can be used for the production of protective coatings and finishing layers of floors, and also in a very wide range in industrial conditions. The developed invention allows to obtain the required adhesion to the substrate: for substrates not subjected to mechanical treatment (i.e. for surfaces not subjected to grinding, sandblasting or shot blasting) and with applied bonding agent, and for substrates subjected to mechanical treatment and applied with a bonding agent.



**Figs. 1-2.** Preparation; **Fig. 3.** Application; **Fig. 4.** Implementation in industrial company;

### Implementation

The invention was implemented in the form of a floor coating in a car repair workshop by URB TOPOLSCY under a cooperation agreement for commercialization purposes. Further implementation attempts are planned as well as talks with manufacturers of epoxy coatings for full industrial implementation.

### Funding

The authors received funding from the project supported by the National Centre for Research and Development, Poland [grant no. LIDER/35/0130/L-11/19/NCBR/2020 "The use of granite powder waste for the production of selected construction products."]