

## The effect of thermal shock on wear resistance of floor composite made of epoxy resin with fine aggregate and concrete substrate

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In this study the wear of floor composite was analyzed before and after the wheel spinning test. The pull-off strength and thermal properties of the composite were verified. The polymer-cementitious composite was made of epoxy resin with aggregate and concrete substrate. The results show that the type of aggregate change the pull-off strength of the composite. Moreover, the wheel spinning can cause the failure of the floor composite because the temperature occurred during the test exceed the glass temperature of the epoxy resin.

**Keywords:** tribology, wear, floor composite, epoxy resin, thermal analysis.

### 1. Introduction

The phenomena of low thermal shock resistance occur in production and warehouse buildings and are crucial for composites with a large area (e.g. floors). The wear of floor can be occurred during spinning of the forklift wheel [1]. The loaded spinning wheel causes the failure of floor by friction force and by rapidly growing temperature in the floor structure. The coatings made of epoxy resin are especially sensitive on temperature changes even during curing time. Therefore, in this study the wear of the polymer-cementitious floor composite made of epoxy resin with fine aggregate and concrete substrate was analyzed. The thermal analysis of composite was performed to study the impact of wheel spinning on the floor structure. The mechanical properties of composite were also carried out before and after wheel spinning.

### 2. Methods

The studies were conducted on polymer-cementitious composites. The epoxy resin was modified with third component to change its properties. The epoxy resin extender (component C) was made of natural and recycled fine aggregate mix. Different percentage portion of recycled aggregate in the mix was prepared to analyze its impact on the thermal and mechanical properties of the coating. The wear analysis of the specimens was performed using apparatus made by authors. The test simulates the wheel spinning of the forklift or other driving machine.

#### 2.1. Mechanical analysis

The adhesion between composite layers was verified before and after wheel spinning test with pull-off strength test.

#### 2.2. Thermal analysis

After each wheel spinning test the temperature change on the composite surface was measured. Moreover, the thermal properties of the polymer were carried out with Differential Scanning Calorimetry (DSC) method.

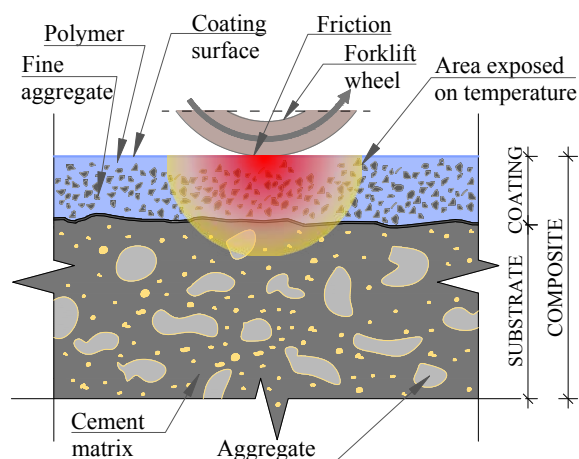


Figure 1: The scheme of the wheel spinning and its impact on temperature change in the composite structure.

### 2.3. Results

The composite pull-off strength increases with recycled fine aggregate volume amount in epoxy resin. The best results occurred specimen with 100% of recycled fine aggregate. The preliminary studies show that the glass temperature  $T_g$  of the epoxy resin without extender is 28.2°C.

### 3. Discussion

The results show that the type of the aggregate can change the pull-off strength of the composite. Higher amount of the recycled aggregate increases the pull-off strength. Moreover, the glass temperature of the epoxy resin coating is much lower than temperature which can be occurred during wheel spinning test. It shows that presented type of failure can significantly affect the wear resistance of polymer-composite structure.

### 4. Acknowledgments

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### 5. References

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