CHARACTERISTICS OF PROTECTIVE GLAZES THAT INFLUENCE RESISTANCE TO PEDESTRIAN TRAFFIC

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1. ABSTRACT

In areas of high pedestrian traffic, such as business or public areas, materials with high technical performance are required, especially with high resistance to wear. In the manufacture of ceramic products, these benefits are achieved through the application of "protective glaze", which is added after the inkjet decoration, typically being translucent glazes and matte finish.

In order to develop ceramic products with high resistance to pedestrian traffic, we have proceeded to characterise commercial parts for the coating of floors before and after being tested for wear resistance to pedestrian traffic (UNE 138001: 2008 IN), that simulates, as has been demonstrated, the actual wear suffered by tiles in high traffic areas.

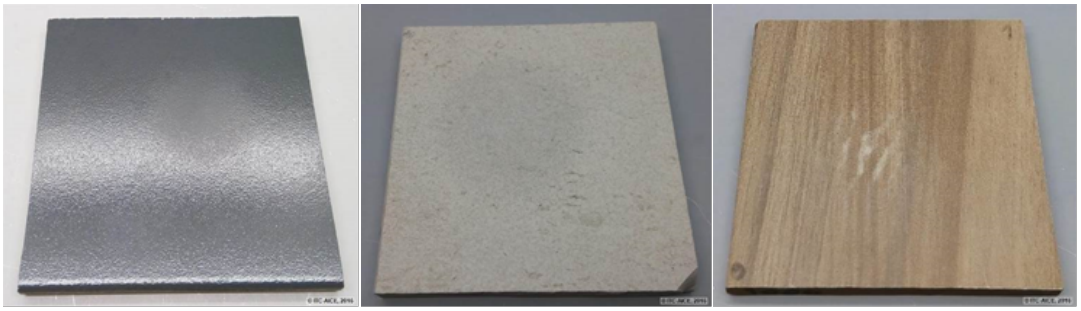
The characterisation consisted in the visual observation of the surface, the creation of a topographic map and the observation by scanning electron microscopy of the surface and of a transversal area of the piece.The comparison of the characteristics of the pieces, before and after the performance of the wear resistance test, has allowed us to determine the most important variables to take into account when developing protective glazes with good wear resistance properties.

It has been determined that the main variables are, the texture of the finished surface, the thickness of the protective glaze layer, being able to establish an optimum thickness range, and the internal porosity of the material related to the staining of the surface.

2. TYPES OF WEAR CAUSED BY PEDESTRIAN TRAFFIC

We have selected 12 samples of different ceramic materials that are used in the floor covering: polished porcelain stoneware, porcelain stoneware with glossy coarse finish, porcelain stoneware with matt finish, porcelain stoneware with matte and coarse finish, porcelain stoneware with matte finish, coarse and non-slip and red stoneware with matte finish.

Said samples were subjected to the test described in the UNE 138001: 2008 IN report "Resistencia al desgaste por tránsito peatonal de pavimentos cerámicos. Recomendaciones para la selección en función del uso previsto" [1]. After the test, the wear suffered by each of them was evaluated and classified according to the type of damage suffered. **figure 1** Photographs of representative samples are attached.



Loss of brightness ***Fouling*** ***Loss of decoration***

Figure 1.*Classification according to the type of damage suffered*

3. MICROSTRUCTURAL CHANGES CAUSED BY WEAR

A topographic map of the samples was made before and after the wear test. The results showed that there is a decrease in surface roughness when the samples are subjected to the wear test. Topographies of **figure 2** an original and worn surface are shown.

It has been proven that the topographic parameter that can be used to evaluate wear is:S_p, maximum peak distance of the surface, which represents the maximum distance of the peak from the average line in which the original surface is divided. The value of said parameter decreases with wear, thus it is possible to use the variation of said parameter to evaluate the wear.

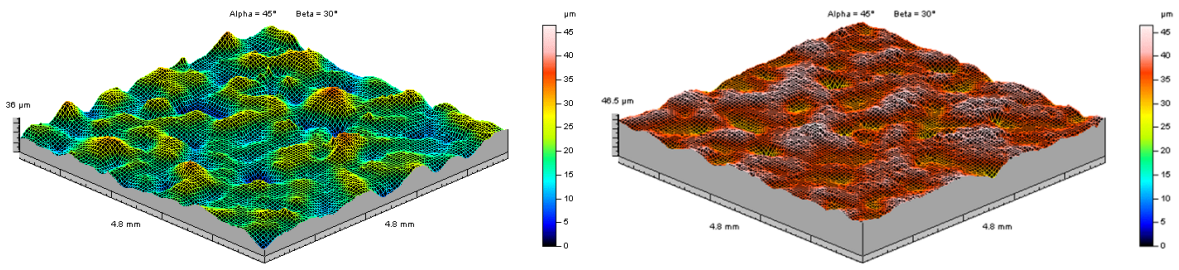
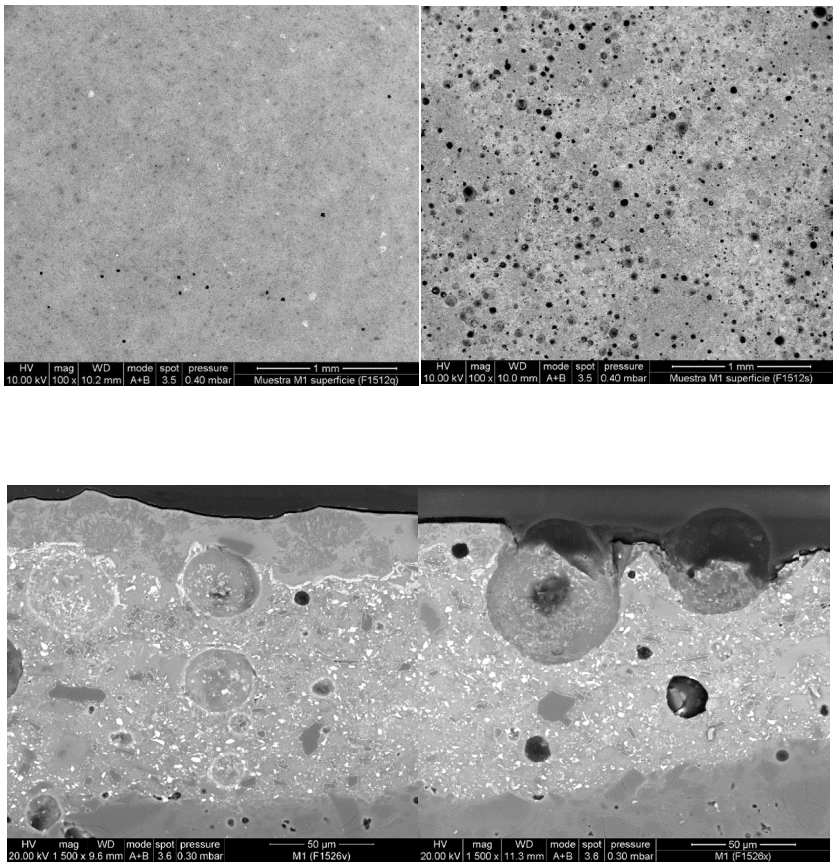


Figure 2. *Topographic maps. Left: no wear, right: worn (2500rev).*

The samples tested were evaluated on the surface and in cross section by scanning electron microscopy (**figure 3**).In general, the samples subjected to wear have a greater open porosity on their surface and thinner protective glaze layers.



Original ***Worn***

Figure 3. *Observation by scanning electron microscopy. Above: surface, below: cross section*

4. VARIABLES TO TAKE INTO ACCOUNT IN THE DEVELOPMENT OF PRODUCTS

It has been found that glossy products, regardless of the type of protective glaze used, have a low wear resistance due to loss of gloss in the early stages of the wear test.

It has been observed in the products that showed loss of decoration that there was no protective glaze. The use of protective glaze is considered indispensable, especially when using inkjet technology for decoration.

The protective glaze is progressively eliminated with wear, which produces changes in the roughness parameters, which modify the properties of the product, such as the sliding resistance [2]. It has been concluded that glaze layers with thickness greater than 50 are necessary μm for the parts to pass the wear test.

The wear generates open porosity, causing soiling [3], so that protective glazes with inferior internal porosities will result in more resistant products.

5. ACKNOWLEDGEMENTS

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6. REFERENCES

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