REVERSIBLE DIRT RETENTION IN GLAZED TILE SURFACES

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1. INTRODUCTION

Most ceramic glazes exhibit a certain inner porosity that depends on their composition and fabrication process. Such porosity turns into apparent porosity as the surface undergoes progressive wear and inner bubbles surface. It was shown in a previous study [1] that dirt penetrates into the pores that open. Some of this dirt is irreversibly retained and cannot be removed by washing. However, an important proportion of the dirt that is retained reversibly in the rough, chipped glaze surface that develops with wear, also contributes to the change in glaze surface appearance in service, though the dirt may be removed by washing. In certain rough, matt, glaze surfaces, reversible dirt retention may already arise in the new tile. However, in glossy glazes, this phenomenon occurs as a result of surface deterioration.

Using the representative parameters of surface topography a magnitude may be calculated that is defined as the "void volume capable of liquid retention per unit area": v_s [2], which is usually employed for assessing the degree of deterioration of engine cylinder sleeves. With a view to having an objectively measurable property whose value allows predicting possible reversible dirtying of glaze surfaces, the relationship has been studied between the value of v_s and visually perceivable reversible dirt retention in glossy, homogeneous glazes, as their surfaces are progressively abraded with a standard abrasion tester.

2. MATERIALS USED

The study was carried out by using test specimens made from industrially manufactured glazed tiles, with a smooth white surface. This type of glaze was chosen because its original surface does not retain reversible dirt, so that the moment can be visually detected, at which the surface starts becoming dirty as a result of the progressive degradation produced by the abrasion tester.

3. EXPERIMENTAL PROCEDURE

The roughness profiles of the glaze surface from which the property v_s was calculated were obtained with a roughnessmeter fitted with a 5 μm diameter diamond pick-up stylus, with a tip angle of 90°.

In order to attempt to relate the property v_s to the reversible dirt retention capability of the glaze surface, the following steps were followed: First, the value of v_s was determined for the starting glaze surface. The value of this property was then measured as the surface

underwent progressive abrasion in the abrasion tester, after each stage attempting to dirty the abraded surface using a mixture of mineral oil and active carbon, then wiping this away with a dry cloth. Reversible dirtying was easily detected since it involved a darkening of the abraded area. When a process stage was reached at which dirt retention became visually perceivable, slightly lower wear intensities were tested in order to lower the interval of the values of parameter v_s within which dirtying could start.

4. RESULTS AND DISCUSSION

In Fig. 1, the value of parameter v_s at which reversible dirt retention started becoming visually perceivable has been plotted for each of the tested glazes.

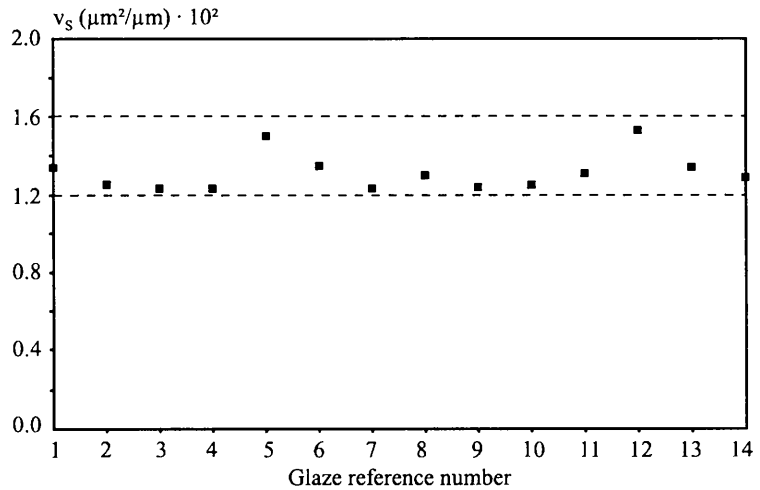

Figure 1. *Value of parameter v_s at which dirt retention started becoming visually perceivable at the glaze surfaces.*

It can be observed that a threshold value has been found for v_s, which lies between 0.012 and 0.016 $\mu m^2/\mu m$, above which dirt retention became visually perceivable at the glaze surfaces, and which was independent of the nature of the studied glazes. This result allows concluding that on determining the value of v_s with a roughnessmeter, it is possible: a) to predict whether a rough or matt glazed surface will start to retain dirt reversibly from the moment the tile is installed; b) to establish the degree of wear by abrasion that a glossy glaze will be able to withstand before starting to retain reversible dirt.

5. REFERENCES

[1] Escardino, A.; Ibáñez, M.J.; Blasco, A.; Amorós, J.L.; Using the roughnessmeter for the quantitative study of ceramic glaze degradation by abrasion. In *IInd World Congress on Ceramic Tile Quality.*. Castellón. Official Chamber of Commerce, Industrial and Navigation 1992, p. 219-243.

[2] Mummery, L.; Surface texture analysis. The handbook; Mühlhausen: Hommelwerke 1990.

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