

# TRANSLUCENT CERAMIC SHEETS CHARACTERISTICS AND PROPERTIES

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## 1. INTRODUCTION

Plak'up is a product made from glazes by pressing and firing. The glaze components are wet milled together with the necessary binders to facilitate subsequent forming. The resulting slip is spray dried and the product is formed by pressing. Finally, the tiles are fired in a single-deck kiln, supported on a continuous bed of refractory material to avoid pyroplastic deformation of the tiles. The result of this process is a material with a vitreous, translucent appearance, which can be used in the form in which it exits the kiln or after subjecting it to a polishing process.

## 2. EXPERIMENTAL

A comparative study was conducted of certain mechanical and surface properties of polished plak'up and of other ceramic tiles (polished porcelain tile and ceramic tiles coated with a polished transparent glaze obtained by wet application), as well as sheets of window glass. The following properties were studied: bending strength, resistance to thermal shock, scratch parameters, wear resistance, impact resistance, resistance to chemical attack, loss of surface quality with wear, stainability, porosity and surface topography.

The tests for determining bending strength, resistance to thermal shock and resistance to chemical attack were conducted as set out in the current standard methods for ceramic tiles<sup>[1][2][3]</sup>. The methods used for the remaining tests are detailed below:

The scratch parameters were determined by making several lines under constant loading on the surface of the samples, using a Rockwell indenter with a 200 μm diameter, progressively increasing the load by 1 N steps. The topographies of the lines made, established with a roughness meter, show the appearance of a surface track at a certain load ( $Q_R$ ). This track becomes wider and deeper as the scratch load rises up to a higher load ( $Q_D$ ), at which the resulting track is no longer clean and the material starts to fracture.

Wear resistance was measured by subjecting the test specimens in a tribometer to the action of a 6-mm-diameter ruby ball, under a load of 10 N. Plotting mass loss versus test time yields a series of points that can be fitted to a straight line, whose slope gives the wear rate, which is proportional to the inverse of wear resistance.

Impact resistance was determined by impingement of steel balls of different mass from varying heights on the specimens, which were supported on three points to guarantee their stability, until failure occurred.

Stainability was established by determining the chromatic co-ordinates of the surface during a staining process with indelible ink followed by cleaning with alcohol.

Porosity was measured by an image analyser, while the surface topographies were determined by a roughness meter.

### 3. RESULTS

Table 1 details the results of the studied properties:

Property		Polished Plak'up	Glass	Polished porcelain tile	Polished transparent glaze
Bending strength (N/mm <sup>2</sup> )		37-50	40-100	40-50	-
Thermal shock (failure cycle)		2-3-4	1	-	-
Scratch parameters	$Q_R$ (N)	21	23	25	23
	$Q_D$ (N)	28	26	40	36
Wear rate (μg/rev)		2	3	1	10
Chemical resistance	Acids	GHA	GHA	GHA	GHB
	Alkalis	GHB	GHA	GHB	GHB
Impact resistance	Weight withstood (g)	130	830	-	-
	Fall height (cm)	57	55	-	-
Polished surface porosity (%)		1.7	-	10	2.6
Stain retention (ΔE*)	Start	2.7	-	14.9	-
	End	0.8	-	9.9	-

Table 1. Properties of the studied materials.

Figures 1, 2 and 3 enable comparing the surface topographies of a piece of polished plak'up with a polished porcelain tile and a polished transparent glaze. The appearance of the respective topographic maps match the corresponding porosity values of these surfaces given in the table above.

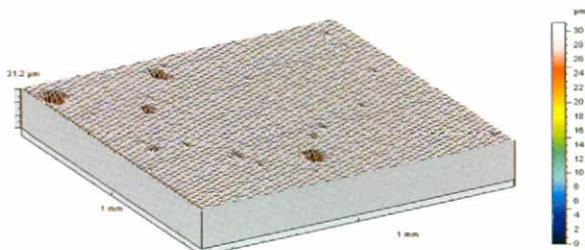


Figure 1. Topographic map of the polished plak'up surface.

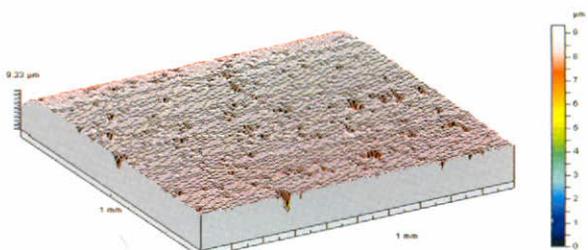


Figure 2. Topographic map of the polished porcelain surface.

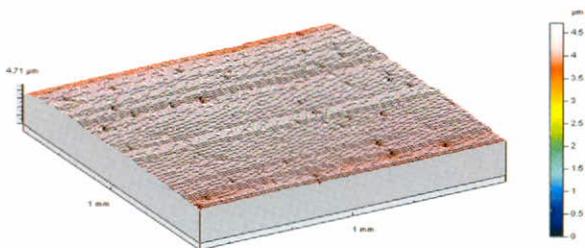


Figura 3. Topographic map of the polished transparent glaze surface.

#### 4. CONCLUSIONS

The results show that the material called plak'up exhibits similar mechanical and surface properties to those of other ceramic tiles commonly used for floor and wall tiling, and are practically of the same order as those of window glass.

The material stands out for its low porosity and low stainability compared with polished porcelain tile.

## 5. REFERENCES

- [1] UNE EN ISO 10545-4: 1997. Ceramic tiles – Part 4: Determination of modulus of rupture and breaking strength.
- [2] UNE EN ISO 10545-9: 1997. Ceramic tiles – Part 9: Determination of resistance to thermal shock.
- [3] UNE EN ISO 10545-13: 1997. Ceramic tiles – Part 13: Determination of chemical resistance.