

## Medición de la tasa de desgaste de materiales abrasivos y cerámicos sometidos a procesos de pulido

Un centro tecnológico español perteneciente al sector de cerámica ha desarrollado una técnica de simulación a escala de laboratorio para medir la pérdida de masa que sufre una pieza en procesos de pulido y determinar su tasa específica de desgaste. El centro tecnológico busca fabricantes de cerámica o maquinaria interesados en establecer acuerdos de cooperación o comercialización con asistencia técnica con el fin de estudiar el rendimiento de materiales abrasivos y baldosas de cerámica.

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Title

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Measurement of wear rate in abrasive and ceramic materials undergoing polishing processes

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Abstract

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A Spanish Technological Centre working in ceramics has developed a technique for laboratory-scale simulation to measure mass loss that a test piece undergoes in industrial polishing processes, what determines its specific wear rate. Partners are sought, such as tile manufacturers or machinery producers, for a cooperation or commercial agreement with technical assistance to study abrasive materials and ceramic tiles performance.

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### Description

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Polishing with grinding tools is a key process stage in ceramic tile manufacture, owing to the cost involved and the technical and aesthetic characteristics that polishing provides the tile with, making process optimisation essential. Pin-on-disk tribometers are used in evaluating the wear resistance of materials of different nature. Originally, wear evaluation with pin-on-disk tribometers (Figure 1) was used to study wear in metallic materials and technical ceramics. The wear produced in these tribometers was determined by measuring the mass loss (expressed in mass or volume units) of the solid being tested as a function of the number of revolutions. The main constraint involved in this type of apparatus, when it comes to simulating an industrial process like tile polishing, is the fact that it is only able to produce circular unidirectional wear. However, a combination of movements occurs in the industrial tile polishing process, involving oscillation of the abrading head as well as forward movement of the tile (Figure 2). This technology offer describes the design of a laboratory-scale tribometer, as well as its use in tests for simulating industrial ceramic tile polishing processes. The tribometer allows the relative sliding speed and the contact pressure between the abrading tool and the ceramic piece to be controlled. When the test ends, measurement of the changes in surface roughness and optical gloss allows the wear, as well as the specific wear rate of the test material and the counterbody (abrader), to be evaluated. This tribometer enables the most important characteristics of the industrial polishing process to be accurately reproduced (Figure 3). Appropriate adjustment of the tribometer operating parameters (standard load and rotating speeds) provides a relative motion between the cylindrical abrader and the ceramic tile, which is representative of industrial conditions. Tribometer design and construction: The developed tribometer uses a cylinder abrader, 12 mm in diameter and 10 mm long, while ceramic test pieces measuring 100x100 mm are required in the laboratory-scale tests. The cylinder abrader and the sample are both firmly held by their respective, devoted tribometer fittings. The apparatus also allows these fittings to be used if it is desired to test ceramic pieces with special dimensions. In the test, a single cylinder abrader mounted on a vertical shaft is used, such that the abrader presses against the surface of the ceramic piece with a rotating motion. The ceramic sample also rotates on a vertical shaft (Figure 4). The developed tribometer allows the key aspects of the contact conditions between the abrading head and the ceramic tile in the industrial polishing line to be simulated. As a result, the quality of the surface polished in the tribometer is comparable to that obtained in an industrial tile polishing line. Innovative Aspects: In tribometers of the pin-on-disk type, the sample is secured to the bottom of the apparatus, with the surface to be scratched face up. The scratcher rests on that surface, applying a constant force as a result of a controlled weight fitted to the top of the apparatus. The base on which the test piece is held moves in a circle. In the new design, a cylindrical abrader, 12 mm in diameter and 10 mm long, is used, which is fitted to the top of the apparatus, while the test piece is secured to the bottom. Figure 5 shows the fittings and cylindrical abrader holder. At present, tile-polishing processes are considered inefficient because of high wear of the polishing and grinding tools, high-energy consumption, excessive product losses, and little control of tile end quality. The polishing process is a critical tile manufacturing stage, since it involves 40% of the product cost. A greater understanding of polishing process characteristics and of ceramic tile performance enables process optimisation and cost reduction. The developed tribometer allows the characteristics of ceramic tiles and of the abrasive polishing media to be quantitatively evaluated. The tribometer is designed as a function of industrial polishing conditions, and addresses key issues such as contact pressure and sliding distance. In order to evaluate surface quality, optical gloss and profilometry measurements are used.

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### Technology Keywords

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Surface treatment (painting, galvanneal, polishing, CVD, PVD) ; Analyses / Test Facilities and Methods ;

Keyword Codes:  
002002014 ; 009001002 ;

### Organisation/Company Type

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Technical Centre/Technology transfer Centre

### Organisation/Company Size

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50-249

### Organisation Comments

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### Collaboration Type

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Joint further development ; Testing of new applications ; Adaptation to specific needs ; Assembly ; Engineering ; Technical consultancy ; Quality control ; Maintenance ;

### Collaboration Comments:

The Centre seeks for partners such as tile manufacturers or machinery producers willing to studying abrasive materials, as well as evaluating tile or ceramic materials performance in the polishing process.

### Stage dev.

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Available for demonstration - field tested

### RTD Prog.

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EU RTD results (FP4/FP5)

### IPR

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Others

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### IPR Comments

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This prototype is available for the performance of tests aimed at studying how materials respond to polishing. Since this technology is the result of a CRAFT project, it belongs to the companies that collaborated in that project.

### Cordis

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### Market Keywords

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Non-homogeneous injections/extrusions ; Other industrial equipment and machinery ;

Market Keyword Codes:  
008001003 ; 008003007 ;

### Market Highlight

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This apparatus can be used in studying abrasive materials, as well as in evaluating tile or ceramic materials performance in the polishing process.