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Acid Etching – A Slip Resistance Panacea?

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This study was conducted for the purpose of increasing the existing body of knowledge among safety professionals and people within the ceramic tiling industry, concerned in particular with slip safety evaluation and the effects of acid etching on ceramic tile slip resistance. This investigation will provide an evaluation of current product claims of slip resistance values for ceramic tiles treated with acid etching. In addition, it is hoped that this area of research will provide an insight onto the extent and effectiveness of acid etching as a procedure to increase slip resistance on ceramic tiles.

Increasing building regulations and occupational health and safety legislation throughout the world has resulted in the subject of slip associated fall accidents to become arguably the most critical safety aspect of flooring and flooring conditions to both industry and society in general.

In competitive markets, intangible aspects are decisive in the product-purchasing decision, at least for the medium to high end market segments. These aspects are related to warmth, image, prestige fashion, design, the brand, or the aesthetics, and as such are attributes more closely linked to the world of decoration, than of construction¹. In many instances, tiles chosen for aesthetic preference may not be well suited for functional slip resistance performance. As such a designer may go to extraordinary lengths to treat a particular product in order to ensure its functionality and yet still maintain the original concept.

Acid etching is a technique that allows for such aesthetically appealing tiles to become functional and safe, or does it? The technique of acid etching increases the surface roughness by chemically changing the structure of the tile surface. The process usually involves applying an etching agent such as a hydrofluoric solution. The etching agent reacts with the glaze and the silica composition of the tile, thus decomposing microscopic amounts of the silica to form valleys and ridged grooves on the surface of the tile. This change in microstructure changes the overall roughness of the tile, hence increasing the slip resistance.

While acid etching is regarded by many in the ceramic tile industry as the most effective technique to increase slip resistance of flooring surfaces, there is minimal evidence on the extent and effectiveness. Much of the information and marketing of acid treatment is inconsistent, unconvincing and the testing methods used to validate such claims, are usually conducted “in-house” and rarely meet Australian slip resistance standards².

This paper evaluated the relative effectiveness in slip resistance in a range of ceramic tiles both before and after the application of treatments by using standardised methods to quantify the changes. Slip resistance test methods utilised included the Tortus, Pendulum and the Inclining Ramp with which confirmed an increase. surface roughness measurements were recorded and did not identify a significant change with the parameters used. Additionally the degree of treatment affected the results significantly.

Although there was an increase in slip resistance there were detrimental effects to the ceramic tiles which included changes in colour and stain resistance. These aesthetic properties which are important to the end user were conducted according to the ISO 10545 Method 16, *Determination of small colour difference*; and ISO 10545 Method 14 *Determination of stain resistance*.

¹ David Gobert Teigeiro, Ricardo Chiva Gomez, Veronique Yael Berger, Javier Sánchez García, Miguel Ángel Moliner Tena, Luis Callarisa Fiol, Rosa Rodríguez Artola and Miguel Ángel López Navarro, “CONSUMER BEHAVIOUR IN THE CERAMIC PRODUCT REPLACEMENT MARKET AND COMPARISON WITH SUBSTITUTE PRODUCTS”, Qualicer 2006.

² Whitfield, K, Bridge, S, Mathews, S. 2005, ‘Selecting Coating for Tiled Floors’, *The University of Sydney: Faculties of Health Sciences and Architecture*