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Study of wear resistance of porcelain glazed tiles by the PEI method: Effect of glaze type and corundum addition

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Nowadays, beyond aesthetics durability and safety in use has been highlighted in the selection of ceramic tiles by the consumer. Therefore, industry providers must specify adequately the location and applicability of their products. In this sense, this study sought to obtain a glaze that promotes the increase in wear resistance of ceramic tiles without producing changes in aesthetic characteristics such as brightness, color and texture. In the work two glaze matrices were selected regarding the boron content of their compositions and the glazes were reinforced by corundum particles. A 2^k+1 full factorial design was selected resulting in nine formulations. The corundum mass fraction and particle size and glazes were the factors of the design (DoE). Wear resistance, change in gloss and lightness, hardness and surface roughness were determined for all formulations. The abrasive wear resistance was measured by PEI method in accordance with ISO 10545. Gloss and color variation were determined by colorimetry. Hardness was determined by micro indentation Vickers and the surface roughness by the Ra profile. The results show some noticeable flaws in the PEI method, ranging from the test procedure to the evaluation of the results, the latter being susceptible to the individual capacity of wear perception. The PEI method does not account to factors that are noticeable by the user such as the loss of brightness. The ANOVA analyses have shown that the glaze with higher boron content was less resistant to wear and have presented the highest variation in brightness due to the degradation of the tile surface. The change in lightness –that affects the visual analysis in the PEI method – was minimized by a low boron content and small particle size of the corundum reinforcement. The surface roughness was lower for a combination of boron glaze with lower content of corundum, probably due to a polishing effect. The hardness results hadn´t statistical significance and were not analyzed.

Keywords: Abrasive wear, PEI method, glazed porcelain, reinforced glaze.