

CHEMICAL RESISTANCE OF CERAMIC TILES: EVALUATION OF THE TIME OF SURFACE ATTACK

J.L.S. Bonfim, F.D. Silva, V.D. Neves, J.F.M. Henrique, L.M. Silva, A.P. Margarido

Ceramic Center of Brazil (CCB) – Brazil

1. INTRODUCTION

Ceramic tiles are widely used in construction due to their durability and aesthetics, ease of cleaning, high mechanical strength and abrasion resistance. In addition to these characteristics, good chemical resistance guarantees protection against possible partial or complete loss of the appearance of the tile's original surface resulting from the chemical products used for cleaning.^[1]

Chemical attack on ceramic tiles occurs when chemical substances react with the surface of the material, generally composed of glassy phases, causing physical and chemical damage. This damage can range from corrosion of the surface of the material, causing stains, discoloration and gloss loss, to the opening of microcracks, which end up exposing the surface pores of the piece, triggering another type of problem, which makes it difficult to clean the product.

To carry out the chemical resistance test in accordance with ISO 10545-13:2020^[2], the test specimens must be exposed to the solutions for 24 and 96 hours. However, waiting 96 hours to obtain the chemical resistance class of the product means a long time for a ceramic company to correct possible problems during the production process or even to release raw materials for production. In this sense, the objective of this work is to determine how many hours it takes for the test solutions to begin to effectively attack the surface of the products.

2. MATERIALS AND METHODS

ISO 10545-13 establishes a standard procedure for determining chemical resistance and its assessment. The test consists of exposing the surface of the ceramic tile to the action of chemical solutions divided into household cleaning products (ammonium chloride and citric acid solution), low and high concentration acids and alkalis (hydrochloric acid, lactic acid, hydroxide potassium) and pool salts (sodium hypochlorite). These solutions are used because their compounds are present in various cleaning products that are sold as disinfectants, detergents, bleaches, post construction cleaning products and grease removers.

To carry out this study, three specimens were used for each test solution. The choice of test specimens used involved various types of surfaces, such as light and dark glossy, light and dark matte, and grained, among other types of decoration commonly used on ceramic tiles. To determine the time, the solutions were applied for 12, 24, 36, 48, 60, 72, 84 and 96 hours, that is, ranging from half the minimum application time indicated by the standard to the maximum time, and intermediate times.

3. RESULTS AND DISCUSSIONS

The results obtained through visual analysis clearly showed that only the dark matte sample suffered chemical attack by hydrochloric acid and the polished sample suffered chemical attack by potassium hydroxide. In Figure 1 it is observed that the exposure time of the solutions has an impact on sample classification.

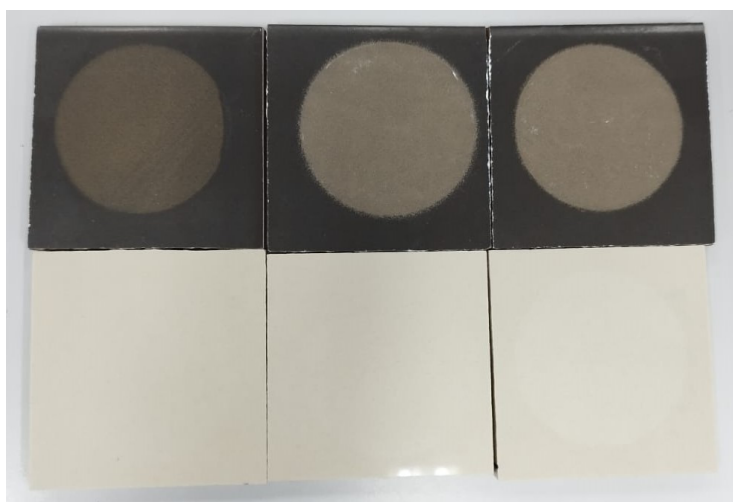


Figure 1: Samples (dark matte and polished) with exposure time of 12, 48 and 96 hours, respectively.

The study investigated the chemical resistance of ceramic tiles when exposed to different chemical solutions over different periods. It is worth mentioning that around 84% of the surfaces, regardless of the time of exposure to the solutions, did not show significant changes.

4. CONCLUSION

The results showed that the interaction of the solution with the coating surface varies, depending on the type of surface and contact time with the sample. However, the majority of the samples did not show any change in classification regardless of exposure time. In particular, it was observed that the dark matte sample was significantly affected by hydrochloric acid and the polished sample by potassium hydroxide. Therefore, the time determined by the standard norm necessary according to the conditions and time presented in this study.

5. REFERENCES

- [1] REVESTIMENTOS CERÂMICOS E SUAS APLICABILIDADES. Ciências exatas e tecnológicas | Maceió | v. 2 | n.3 | p. 87-97 | May 2015 | periodicos.set.edu.br
- [2] ISO 10545-13 - Determination of chemical resistance