CHARACTERIZATION OF POLYMER MORTARS EXPOSED TO SOME ACID SOLUTIONS.

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Introduction

In this paper resistance to chemical attack for tiles is analysed according to the standards UNE-EN ISO 10545-13. These standards establish a series of tests at room temperature which visually analyzes the effect on the appearance of the surface of aqueous solutions of various chemical products. In this paper, tiles made with polymeric mortar prepared with calcium carbonate aggregates have been tried. Possible chemical attack on the surface of the tiles after being submerged in the different solutions has assessed by visual observation as well as optical microscopy.

Until recently, it was assumed that a resistant material was inevitably a durable material, and therefore construction materials technology focus to reach higher mechanical resistance [1]. In recent decades, polymers have been used in the production of composites with mechanical resistance and durability enhanced [2,3]. These composite materials use polymeric resin as a binder rather than Portland cement and water. Polymer mortars show high resistance to bending and compression, as well as a chemical improved resistance in aggressive environments, especially when compared to ordinary Portland cement concrete [4]. The latter is an example of a material widely used but its durability is low in some service conditions and this seems to be the price paid by its universality. Binder in the polymer concrete is a resin polymerised with the help of additives, namely: an initiator and catalyst [5]. Hydration of Portland cement concrete products are alkaline, and therefore react with acids environments. Over time, being exposed to such media, this type of concrete show signs of reactivity [6]. However, in the case of Polymer Mortars (PM), the binding agents such as polyester, epoxy, vinyl and phenol are typically used and show a good chemical resistance in acid environments and so the PMs prepared tends to reproduce the inherent characteristics of the used binding agents [7, 8].

Various construction products have emerged in the field of application of polymer matrix composites (compac, silestone, ...) to essentially serve as a coating and cladding of buildings. In this mixtures the typical siliceous aggregate characteristic of PMs has been partially merged or replaced entirely by nature carbonated mineral. Such materials present a verified vulnerability to acid due to differential pH [9].

According to other authors, UP resins generally have an excellent performance to weathering, water, bleaches and detergents, saline solutions, some acids and diluted alkalis, drinks alcohol, gasoline and diesel, qualities which are stimulated the more closed is their surface texture. On the contrary, they can not resist boiling water, chlorinated hydrocarbons and other organic solvents and concentrated acids and alkalis even diluted. For more specific data are shown in [10] after long term test (three years) of exposure to chemical agents. Results show that tested mortars do not show any alteration under attacks such as animal fats, beer, acid lactic or urine. Exposed to oil PMs darken, vs. gasoil yellowing slightly, suffering light attack and discolouration to sulfuric acid. Finally under a chemical agent such as acetic acid they disintegrate completely. Few authors that refer to organic acids as the acetic or citric the attack have been found. [11]. Others point out that the loss of resistance to bending to a polyester polymer mortar can reach up from 30% for mortars immersed in sulphuric acid (H2SO4) solutions to sodium chloride (NaCl) or 10% to 10% for a period of 90 days.

Experimental and results

Specimens of three different PMs have been tested and they all show poor resistance under weak organic acid, citric acid in solution. The extent of degradation affects the entire surface of the material, although degradation is not limited only to it. The solution quickly spreads of polymer mortars particularly in the case of the more porous PM. The solution attacks the strongly the limestone, but also degrades the polymeric matrix polymerized, as

well as the interface between the various components, matrix and arid. All tiles submerged in citric acid solution, (Figure 1) show not only partial or complete loss of the original surface but the material is strongly attacked, it softens and decomposes.

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Figure 1. Chemical resistance test