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STONE CRYSTALLIZATION

WHAT ?

WHY ?

HOW ?

WHERE ?

TECHNICAL ARTICLE
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What is Crystallization?

In Crystallization, the top surface of the stone is altered chemically. In this process a steel wool pad is used in combination with a weighted floor machine and acid solution to bring a polish to stone floors. The most common ingredients of crystallization chemicals are acid, magnesium fluorosilicate, aluminum fluorosilicate, zinc fluorosilicate, and water. Some crystallization products may also contain waxes. The chemical reaction illustrated below shows the process taking place during crystallization.

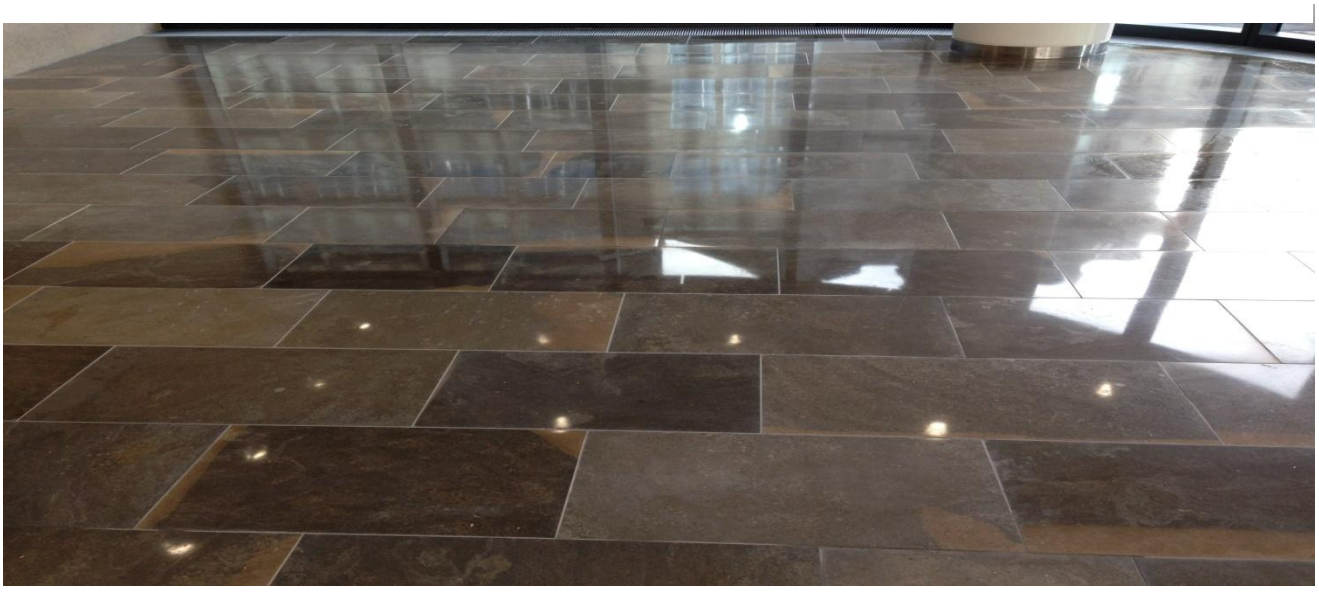
$MgSiF6 + 2HCl + CaCO3 \rightarrow CaSiF6 + MgCl2 + CO2 + H2O$

Or

$3CaCO3 + MgSiF6 \rightarrow MgSiCO3 + 3CaF2 + CO2 + H2O$

In this reaction the magnesium salts are primarily left on the surface of the stone and removed during the next cleaning of the surface, and the calcium fluorosilicate (CaSiF6) is bonded to the underlying stone and is now the layer we walk on.

The surface of the stone has now been chemically altered and there is no way to reverse the process. Note that this new surface of the stone is not a coating but is now part of the stone itself. The only way to remove a crystallized layer is through mechanical action such as diamond honing with diamond discs or the SRDS' (scratch removal discs). Chemical strippers commonly used to remove acrylics will not remove crystallization The resulting layer of calcium fluorosilicate formed on the surface of the stone is harder, glossier, and more stain resistant than the original stone surface.



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The crystallization process consists of spraying a liquid onto the marble floor and buffing it in with steel wool under a standard speed floor machine. The steel wool generates heat through abrasion and the chemical reacts with the marble, producing a new compound on the surface of the stone.

Almost all crystallization chemicals contain two main ingredients: acid, fluorosilicate compounds and sometimes, waxes or acrylic polymers. Crystallization can only react with calcium-based stones such as marble and limestone. Although the process can work on non-calcium based stones such as granite, the reactions are entirely different. In the chemical reaction, acid attacks the calcium carbonate of the stone, leaving an etch mark on the stone surface. When the crystallization liquid is sprayed on a marble surface, the acid attacks the calcium carbonate. The fluorosilicate compound then attaches itself to the calcium ion, forming a new compound called calcium fluorosilicate.

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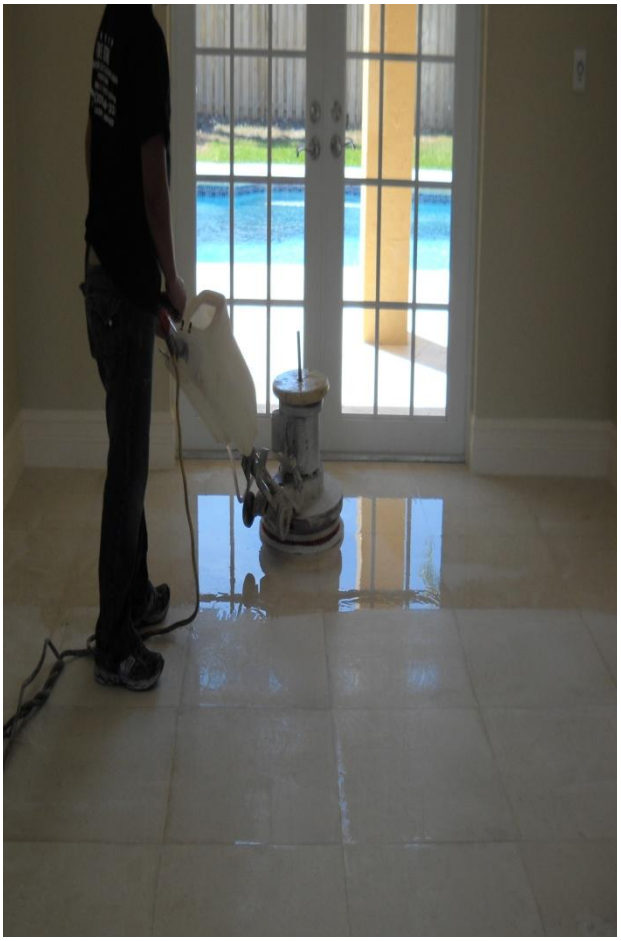

Simply put, the crystallization process works by forcing one ion from one molecule to another in the cement matrix that holds the crystals together. This forms a new cement matrix that can be harder than the original cement matrix of the stone. The newly hard and the preexisting softer structures form two layers, and thus a layer of separation is between them.

In many stone varieties, especially those that contain carbon elements, this causes the stone to delaminate. In others, especially many low and medium density limestone, this causes iron (from the steel wool) to enter into the stone's chemistry. All stones that undergo this process have dramatic changes in their element construction. In order for this reaction to take place, frictional heat must be generated. This is the reason for using steel wool on the buffing machine.

The process must be performed by trained operators' who are familiar with the techniques of this process. Excessive moisture in the stone can hamper the crystallization reaction and cause problems.

When and Where to Use!!!

To begin with, there is no one product or process that is the be-all and end-all to maintaining polished marble & terrazzo. Crystallization is simply one method of many that may or may not be the application of choice depending on the floor.

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Obviously, one would not want to use crystallization on a honed, non-reflective surface. This process is meant only for polished surfaces. If one is confronted with maintaining a large polished marble or terrazzo floor with high foot traffic, an excellent way for maintaining this polish, more times than not, will be crystallization.

It is to be known that, today, some crystallizers contain wax. This can create a build-up on the stone surface over time. When this happens, you will need to use an alkaline detergent, recommended by a professional in the industry, to remove this build-up.

If the alkaline detergent does not remove the build up, then you will need to use diamond abrasives to remove the build-up before continuing the maintenance program.

There are proven crystallization products in the market place that contain zero wax.

This is a maintenance process, not a restoration process. By overusing a no-wax crystallizer and allowing it to build up on the surface, you're pushing the product to remove deeper scratches in the surface that it cannot remove.

This type of damage should be removed by restoring the floor with diamond abrasives. Another popular method of maintaining polished marble is the use of powder/paste compounds, which contain oxalic acid or potassium oxalate, among other ingredients.

Here, you're attempting to recreate what happens in the stone processing factories around the world. The factories polish most marble in a polishing line, running the material through a series of abrasive stones. The final polish is achieved by using something such as 3200 grit; this grit's main ingredient is oxalic acid or potassium oxalate.

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The factory polish is created by chemically transforming the marble surface with the acidic slurry from the 3200 grit. This transformation changes microns of the surface from calcium carbonate to calcium oxalate.

Maintaining polished stone surfaces with oxalic acid compounds usually provides great results and is a widely accepted method. However, these types of products may have adverse effects on green and maroon stones. These compounds will also begin to build up on the surface if overused.

In many cases, the buildup occurs quicker than crystallization. Also, when compared to crystallization, the process can be slow and messy.