

RE-CRYSTALLIZATION-REVISTIED

By Dr. Frederick M. Hueston

The following is a reprint of an article I wrote in 1990. I have edited some of the text to bring it up to date. My opinion on this process is still the same as it was in 1990, "re-crystallization" can damage your natural stone or terrazzo, sometimes beyond repair. Most of the damage I have seen since 1990 by this process results from the overuse of the product as well as the lack of trained personnel who apply it.

To answer the problems experienced by customers who had dull and scratched marble. I tried to find the best and most practical solution to the restoration of their marble floors, walls, etc. Since this is a relatively small industry, there weren't too many good sources. I did find some self-proclaimed "experts" who introduced me to the idea of "re-crystallization" as a safe and easy method of restoring and polishing marble and stone. They touted it as a time proven process which had its roots in the marble industry in Europe. It was alleged to be safe, easy to apply and was both slip resistant and permanent. In short, it was the perfect solution for most marble restoration and maintenance problems.

Having been raised in the "old" school, I instinctively doubt anything that appears "too good to be true". Experience has taught me that most of those "too good to be true statements" usually turn out to be exactly that!

My business reputation is at stake whenever I recommend or use a product or procedure. I don't take that responsibility lightly. So, I endeavored to get answers to some specific questions about this "re-crystallization" process (from the systems' promoters).

Question #1

Does the "re-crystallization" process contain waxes?

Crystallization Answer:

No.

Question #2

Does the process allow the stone to breath (transpire)?

Crystallization Answer:

Vague generalizations and evasive replicas.

Question #3

How does "re-crystallization" react with stone?

Crystallization Answer:

Evasive generalizations.

These evasive non-answers surprised me. Perhaps there was something that these crystallization "experts" did not know or did not want me to know.

Though I am in the stone consultation business, my formal education is in *Chemistry*. I had a natural curiosity about this wondrous process called "re-crystallization". After all, if it worked, it would be great for my business. I decided to do some research on my own. Following is a summary of my research.

TERMS

The term "crystallization" is defined as the process by which a substance takes the form of a crystal structure. Most minerals are crystal shaped. The term "re-crystallization" implies that a substance has been crystallized a second time. In other words, changed from one crystal shape to another.

In geology, re-crystallization takes place under great pressure at high temperatures deep in the earth and over thousands of years. My research showed that the natural re-crystallization of minerals such as those found in stone is unlikely to be obtained with the so-called packaged chemical "re-crystallization method" being marketed by a number of companies. We can therefore assume that the term "re-crystallization" is used only as a marketing term.

For the purpose of this article, we will use this term, "re-crystallization", only as a description of the chemical process that follows.

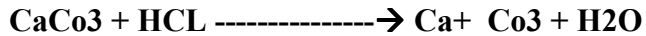
METHODOLOGY

I obtained Material Safety Data Sheets (required by OSHA for all chemical products) from a good sample of "re-crystallization" product distributors. From them, I learned that all the re-crystallization products contained a fluorosilicate compound. All contained an acid of one type or another and almost all contained varying percentages of waxes and acrylics.

To understand how these ingredients react with marble, one needs to understand the makeup (natural composition) of marble, itself. The main constituent of marble is a compound called Calcium Carbonate (CaCO_3). Calcium Carbonate, along with other minerals, make up what we know as marble.

When an acid is dropped on marble it will burn and etch the surface leaving a pitted, dull spot. The reaction (Formula 1) illustrates what happens when an acid and marble come in contact with one another. The bond between the calcium and the carbonate is broken, producing water and carbon dioxide gas and the calcium carbonate is destroyed. In other words, acid destroys marble. All re-crystallization fluid contains acid. If you have any doubts, place a drop of re-crystallization fluid on a piece of marble, wait just 30 seconds and wipe it off. You will find that it has etched.

FORMULA 1



The main ingredient used in re-crystallization fluid is a group of compounds called fluorosilicons. Three types of fluorosilicates can be found in re-crystallization fluids: (1) Aluminum fluorosilicate (2) Magnesium fluorosilicate and (3) Zinc fluorosilicate.

First used in 1883, fluorosilicate compounds were used in an attempt to preserve marble statues that were crumbling. The effects of these compounds on stone were studied by several researchers and were found to have *detrimental effects* on the stone.

It was found that fluorosilicates deposit an enamel on the surface of the stone which completely blocks its pores. The stone suffocates, begins to break apart and rot. The results of these studies can be found in the book *Stone Decay and Conservation* written by Giovanni G Amoroso and Vasco Passins---ELSEVIER, Amsterdam, Lausanne, Oxford, New York 1983.

The re-crystallization process uses an acid that attacks the calcium carbonate in the stone (Reaction 1). This reaction destroys the calcium carbonate and releases the calcium ion. The fluorosilicate compound then attaches itself to the calcium ion forming a new compound (Reaction 2 & 3). This new compound, calcium fluorosilicate forms an imperious film on the surface of the stone, totally blocking its pores.

Marble and Stone FACT: Marble and stone must breathe (transpire). If the pores are blocked, moisture from the slab (condensation, etc.) will be trapped and the stone will begin to break down.

Re-crystallization FACT: The re-crystallization process places an impermeable coating of fluorosilicates on the stone, completely blocking its pores.

Marble and Stone FACT: Acid will destroy marble and stone.

Re-crystallization FACT: All crystallization fluid contains acid.

Based on the preceding facts, I have reached the following conclusion:

The above *facts* are clear and incontrovertible. What is even more startling are the dozens of marble floors and walls I have seen that have been *destroyed* by this process. Along with other responsible stone restoration firms in the industry I urge anyone even thinking about allowing a "crystallization" process to be used, test the proposed products on a marble sample and judge the results for yourself. You will find the rapid deterioration of the marble frightening.

For the names of responsible stone restoration firms, you are invited to write Building Stone Institute, Marble Care and Maintenance Companies, 420 Lexington Ave. New York, New York 10170.

AN OPEN LETTER TO THE PEOPLE IN THE TRADE:

The extensive marketing of restoration methods using "re-crystallization " is a very serious matter for everyone in the industry. The alarming increase in the number of complaints regarding permanently damaged marble and other stone floors and walls is hardly conducive to increased sales and use of our fine products. This damage could have, and should have, been avoided. I urge you to advise all your customers of the potential damage from any of these "re-crystallization" methods being marketed. Now that we know exactly what this so-called "re-crystallization" process is, we can answer the frequently asked question:

Can a floor or wall that has been "re-crystallized" be saved?

Here are some guidelines:

Determine that crystallization has actually been used

First, determine that crystallization has actually been used. For a start, ask the customer. Some will tell you, others will flatly deny it, and others simply won't know. If the shine on the marble or stone looks wavy (acrylic looking) then you can be fairly sure there is some type of coating on it. It is relatively easy to determine the type of coating. To do this two chemicals are needed: (1) a commercial wax stripper and (2) methyl chloride (wood furniture stripper).

Place a small amount of each chemical on the stone. If the commercial wax stripper removes the film then you are dealing with an acrylic type finish. Simply remove the finish with the stripper before starting the normal restoration or polishing process.

If the commercial stripper does not remove the coating but the methyl chloride does, then you have a urethane based coating. Remove it with methyl chloride or grind it off.

If neither one of these strippers removes the coating, the chances are it has been re-crystallized.

Another reliable clue is the presence of swirls on the marble (or other stone). These are caused by the use of steel wool during the re-crystallization machining process.

Before you attempt any polishing or grinding make sure that you have determined the type of coating on the marble (stone). Be aware that there may be more than one coating, possibly an acrylic coating placed on top of a re-crystallization coating, test several areas to be sure.

Determine the extent of the damage to determine if the stone can be saved

If it is discovered that the marble (stone) has been re-crystallized, whether or not the stone can be saved will depend on the severity of the damage. For example. Travertine and Crema Marfil will exhibit damage almost immediately. Other stones, such as granite, will take longer. Still others will not show any apparent damage until the re-crystallized layer begins to wear off. It pays to become familiar with the various types of marbles and other stones.

There are a few general rules to determine the extent of damage.

- The higher the CaCO₃, the more destructive the re-crystallization will have been.
- The greater the number of applications of re-crystallization over a period of time the greater the chance of *irreversible* damage.
- The veining in some marble will be adversely affected first. If these veined areas crumble easily, when probed with a blunt instrument, the stone may be damaged beyond repair. If the amount of veining is not too extensive, it may be saved by filling with a poly resin such as Akemi.
- Perform several Patch Tests. Grind the stone and bring it up to a polish. If the stone polishes, the chance are it can be saved. **CAUTION:** make absolutely sure you have removed the re-crystallized layer entirely. We recommend starting with a 60 grit for most stones.

A FINAL WARNING: some of the companies have begun to eliminate the term "re-crystallization" and are substituting "marble polishing" or "Vitrification". Be cautious. Even if it carries the name of a nationally known chemical firm, check their claims. Ask to see the Material Safety Data Sheets. If the product contains fluorosilicates, do not use it. The hard sell "marketing" of these products is bringing us very close to an epidemic of severely damaged natural stone and terrazzo floors. A few clients (who simply did not know better), having just installed brand new marble floors, have witnessed the damage caused by re-crystallization first hand, at their expense.

We all know that there is no such thing as a totally "maintenance free" floor. Marble, granite, slate, whatever, all flooring must be maintained. The type of maintenance varies with use. Obviously, an entrance foyer of a residence requires a very different maintenance schedule than the lobby of a downtown high-rise office building or a major hotel.

Maintenance can be done quite simply, using recommended products and procedures. However, after extensive wear and tear over a long period of time a client may wish to have professional restoration work done. This can best be achieved by employing a responsible firm using traditional methods. These firms will look at an installation and provide a written estimate not only of the costs involved (usually figured on a square foot basis) but also of the materials that they plan to use. They should have their own equipment, and **trained** crews who have quality experience with the marble and other stone floors.

Updates:

Since 1990 I have conducted several vapor emission tests on marble and stone surfaces to determine if the re-crystallization process in fact does not allow stone to breathe. In my testing I have found that in most cases the re-crystallization process does in fact block vapor emission, therefore not allowing the stone to breathe.

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