

Cleaning with Vinegar An old idea gone wrong!

By Scott Worthington

Technical Article

The recommendation of using vinegar to routinely clean and maintain tile and stone has been around for years. The fact that it is still a recommendation in many documents and specifications from both manufacturers and specifiers shows just how far we have to go in educating the wider market. But perhaps more importantly it reveals the fact that many people still do not understand the impact and damage even the use of a dilute acid such as vinegar (acetic acid) can have on a tile and stone installation.

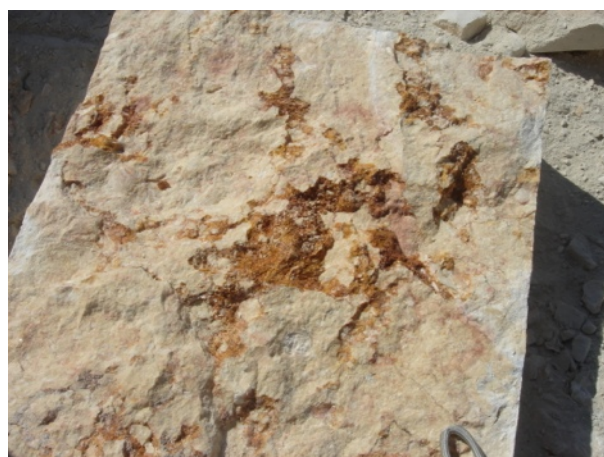
To understand the damage acids can affect on tile and stone you must firstly understand the nature of acids. Acids are chemicals that have a high ratio of hydrogen atoms are positively charged and are donors of protons. On the familiar Ph scale they register between 1 and 6.5. In contrast alkaline chemicals have low concentrations of hydrogen ions, are negatively charged, accept hydrogen ions and register between 7.5 and 14 on the Ph scale. The opposite charge of acids and alkaline chemicals is very important as it means they attract each other easily creating new compounds and reactions. It is these reactions that can be so damaging. For example vinegar (acetic acid) dissolves baking soda (bicarbonate of soda) and hence will easily dissolve other alkalis such as the common calcites that make up limestone and marble.



Exposure of hydrochloric acid to this limestone results in an instant dissolution of the calcium as can be seen by the "fizzing" of the stone. The acid also reacts with the iron deposits in the stone which in this case is the reason for the acid wash. However in most cases the acid is not cleaned or neutralized and hence crystallizes and remains dormant until next exposed to water. This in our case can be water from the installation process or even the application of a sealer. As you can imagine this can lead to poor sealer performance, impact negatively on the adhesive and grout performance and in some cases contribute to ongoing efflorescence problems.

However it is not the positive and negative charges of acids and alkalis alone that make them so ready to react; it is also the fact that acids contain high concentrations of hydrogen ions. Hydrogen is the most abundant element in the universe. It is the simplest and lightest element and when combined with oxygen as a gas burns very easily. It is this reaction (along with other gases such as helium) that fuels our sun and other stars in the universe. Hydrogen has only a single electron and therefore easily combines with other atoms making it a highly reactive element. It is this fact combined with the positive charge that makes acids so reactive and ultimately damaging to the almost exclusive alkaline world of stone and tile.

The high reactivity of hydrogen (hence acid) means a reaction and damage can occur with relatively low concentrations. It is this fact that is totally overlooked when people use simple acid solutions such as vinegar to maintain tile and stone. A simple experiment as shown in the article below demonstrates how damaging vinegar can be to calcium rich compounds. In this case it is the reaction between the acid and the calcium rich eggshell that creates salts (efflorescence) that in turn attack and destroys the shell.



Exposed and dissolved iron compounds deliberately attacked by acid washing to produce an "antique" effect.

Bynes efflorescence on an eggshell

By Morten Ryhl-Svendsen

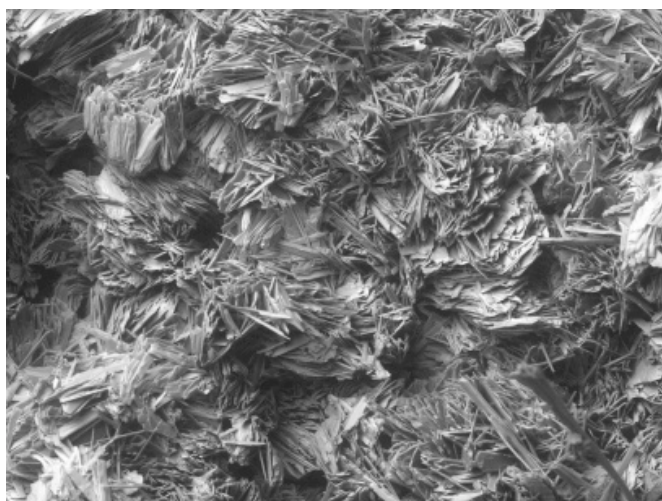
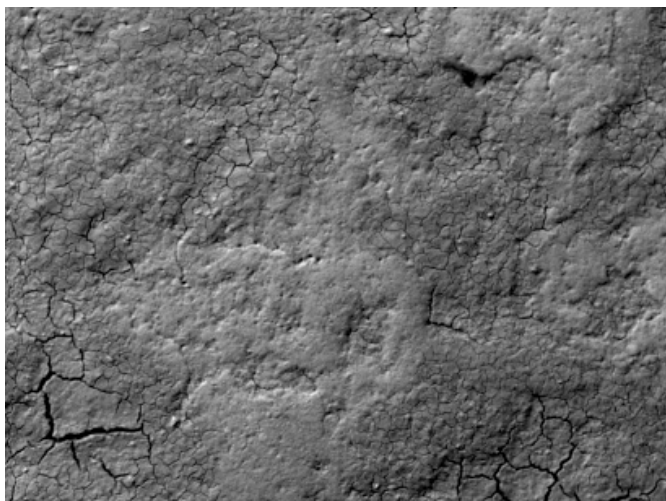
This is an example of the deteriorating effect of acetic acid (vinegar) vapors on calcareous objects. In the photograph two hens eggshells are shown. The one on the right has been stored in an inert environment, while the one on the left under laboratory conditions has been exposed to acetic acid vapors and high humidity for one month. The surface of the eggshell is heavily attacked by efflorescence. A few days after the photograph was taken, the shell crumbled to dust.

The salts that are formed in the calcium carbonate structure of the eggshell are calcium acetate. The salts are then a mixture of hydrated calcium acetate salts and calcium acetate formate salts.



Photo © Morten Ryhl-Svendsen, 2000

Below is shown two 150x Scanning Electron Microscope (SEM) images; the left hand image is of the surface of the egg shell stored in an inert atmosphere (no salts), the right hand image is of the surface of the egg shell stored in an acetic acid containing atmosphere (lots of salt efflorescence).



Thanks to Jettie van Lanschot, School of Conservation, Denmark, for

This damaging effect can also be seen outside of the laboratory. The photos below show how the use of vinegar on a basalt installation triggered damaging salts. In many cases this reaction can occur simply through exposure to moisture. However this job was routinely cleaned with vinegar (acetic acid) and hence both the water and acid created the salts. The acid not only produced the corrosive salts but would eventually dissolve the calcium compounds present in the basalt resulting in a slow deterioration of the stone surface. The acetic acid and corrosive salts also attack the calcium rich grout joint dissolving the cement (lime) binder resulting in even more moisture and acid entering the system. In other words continuing use of vinegar to clean this floor will lead to a slow systematic destruction of the installation even though the vinegar is thought to be a weak or light acid solution.



Salt and resulting damage created by the ongoing use of vinegar (acetic acid) to maintain the basalt.

The answer is of course to use cleaners that are chemically compatible with stone and tile. It is not widely known but just about all of the stone and certainly tile used both commercially and domestically is alkaline. This makes it easy to define what a compatible cleaner is – it is ph neutral or alkaline. Using cleaners of this type will ensure that no damage is done to the tile, stone or grout and adhesive system, as these too are mainly derivatives of alkaline chemistry. New Nanotechnology is also impacting on the way tile and stone is maintained but these are also based on variations of ph neutral or alkaline compounds. In summary use or specification of acid cleaners (regardless of how dilute they may be) is a continuation of an old but flawed belief that dilute acids are “safe” to maintain stone and tile; a continuation of an old idea gone wrong!

Featured Products

Aqua Mix Cleaners

Concentrated Stone & Tile Cleaner

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Stone Deep Clean

A concentrated heavy-duty cleaner and degreaser formulated to clean stone surfaces that have been neglected or subjected to heavy use.

