

Is all efflorescence white? (Vanadium & Manganese)

When the word efflorescence is mentioned we usually refer to the white material often seen on tile, stone, brick, concrete and masonry. In fact many believe the word efflorescence only refers to this material. However this is not true. Efflorescence refers in fact to many different types of salt that do not always manifest themselves as a common white crystalline deposit. More importantly the proper identification of efflorescence is essential for correct removal. If the wrong cleaner is used the salt may be more difficult to remove resulting in even more staining that in some cases becomes impossible to completely remove. Two of the more common salts that should be referred to as efflorescence are those of vanadium and manganese. However incorrectly identifying them can create ongoing maintenance issues as I have just described.

Vanadium and manganese salts are more common than you may think, hence I want to discuss these salts, how they form, where they come from and how you remove and prevent them.

Vanadium

Firstly exactly what is a salt? A salt is a compound in which metal atoms (or in some cases electro positive radicals such as ammonia) replace one or more of the replaceable hydrogen atoms of an acid. For example common table salt, sodium chloride, can be formed by combining hydrochloric acid (HCL) and sodium hydroxide (NaOH). Therefore when we talk about Vanadium and later Manganese we are talking about the salts of the respective metal atoms.

Vanadium appears as either a green or yellowish stain on especially light coloured terracotta and brick. The vanadium salts originate from the clay deposits and are usually vanadyl salts, consisting of sulphates and chlorides or hydrates of these salts.

Vanadium comes to the surface in a similar manner to "common" efflorescence in that it firstly requires moisture as a catalyst and then migrates to the surface as a vapour – hence it has to be a soluble salt in the first instance. One difference is that in the process, vanadium oxide and sulphates are dissolved resulting in a solution that is quite acidic rather than alkaline. As is the case for all efflorescence vanadium should be removed as soon

as possible. If it is left or is identified incorrectly and then cleaned with the wrong cleaning chemical it can become worse and in some cases impossible to remove. If for example an unbuffered acid such as hydrochloric is used to remove the stains it will do the opposite. In this case chloride salts of vanadium will form which are insoluble, leaving a brownish deposit that is almost impossible to remove.

The correct way to clean vanadium is with caustic materials. The use of cleaners with a base of either sodium hypochlorite or sodium hydroxide will do a good job of removing vanadium salts. Aqua Mix Heavy Duty Tile and Grout Cleaner is a good example of an alkaline cleaner for this task. It is preferable to use them on a dry surface so that the solution can penetrate the tile or brick. Rinsing with clean potable water is recommended after cleaning. It may take several exposures to completely remove the vanadium.



Vanadium on brick



Vanadium sometimes incorrectly identified as mildew or bacteria

Manganese

When a brown, tan or occasionally greyish/brown residue appears on either a grout joint, tile, brick or stone surface it is in most cases manganese efflorescence. Manganese can be naturally occurring as seen in some sandstones as well as man made where manganese is used as an oxide in ceramics to produce brown hues. Unlike vanadium and "common" efflorescence manganese is usually insoluble in water. Therefore to migrate to the surface it firstly needs to be dissolved and this happens primarily when the tile, stone or grout is exposed to an unbuffered acid. The acid can come from an acid wash (something we at Aqua Mix do not recommend as a standard installation practice), from inside the stone (if for example it has other soluble compounds such as iron sulphides that can, when combined with oxygenated water, form sulphuric acid) or in some regions highly acidic rain.

Manganese is further related to vanadium in that it is the sulfate and chloride salts of manganese that migrate to the surface. However unlike vanadium and "common" efflorescence manganese is actually neutralized by the lime in the cement grout joints forming an insoluble compound manganese hydroxide which in turn after thorough drying forms the resulting insoluble stain manganese tetroxide. Removal of manganese unlike vanadium requires an acid, the most effective being oxalic acid. As acid can damage the surface of some tiles and stone and will damage all cementitious grout joints it is advisable to pre-wet the surface before cleaning. A thorough rinse with clean potable water is essential as any remaining acid can not only damage the surface and grout joint but also reactivate dormant manganese.



Manganese staining in the grout joint

Of course prevention of both these salts of efflorescence is preferable to removing them. The same system for controlling "common" efflorescence will also control these two salts; in other words minimizing the amount of water that sits on and penetrates into the tile, stone or brick surface. The use of waterproof membranes, correct falls, latex modified grouts and mortars and the proper installation of flexible sealants all work together to give maximum protection. The last part of the preventative system is of course a grout and or tile and stone sealer. Good breathable sealers greatly reduce the amount of water that enters the system and in doing so lowers the risk of efflorescence. In the case of manganese (where water is not the catalyst) the sealer reduces the amount of buffered acid (if required) that can penetrate the surface lowering the risk of reaction. This means using a premium sealer with good acid resistance like Aqua Mix Sealers Choice or Ultra Solv.

In summary efflorescence encompasses more than the "common" white residue we all refer to when we use the word. More importantly we need to learn how to identify the different salts as getting it wrong can create problems and stains that become impossible to remove. The key to the future safe removal of problematic salts such as vanadium and manganese (which appear to require different chemicals for removal) is finding a safe cleaner that can actually remove both without creating additional side effects.

This means a buffered solution, one whose ph will not dramatically change or waver when exposed to the variable ph environment of the salt, stone or tile. Buffered also, so it does not react with reactive salts such as manganese.

Aqua Mix will launch a new product with these capabilities in January – February 2007.



Manganese deposit on brick and grout joint

We have moved - effective October 2006!

The new facility has bigger warehouse & office areas, dedicated training rooms for tile & stone care courses plus a product testing facility.

Address: Unit 7, 38 Waratah Street, Kirrawee NSW 2232

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- ✓ Suitable for interior application only
- ✓ Water-based blend of acrylic polymers
- ✓ Non toxic, Non flammable

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Use on textured porcelain, ceramic tile, natural stone (such as tumbled marble, flamed granite, slate, sandstone, and quartzite), quarry, saltillo, terra cotta, cement pavers, masonry surfaces and other porous stone, tile and grout where a high gloss is desired.

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