

Why Do I Have Blue/Green Staining Of My Bathroom Fixtures, or Ceramics?

Green or blue water staining are names given to a general corrosive attack that on rare occasions occurs in buildings that have been plumbed in copper. In most instances this phenomenon manifests itself shortly after a new plumbing system is put into continuous service and then eventually goes away. Notice of this situation occurs, and concern generally arises, when it causes a slight blue or green discoloration in the water or, more commonly on surfaces that come in contact with the water such as plumbing fixtures and ceramics.

There are a number of processes that can cause this discoloration and staining, two of them much more common than the others. Regardless of the method of attack the resulting discoloration occurs due to a fine dispersion of copper corrosion products in the water conveyed by the system. Elevated copper levels may be a result of either dissolved copper, particulate copper, or both. Usually in cases where this occurs, the inside surface of the tube will be covered by a loosely adhering powdery scale or, if the water velocities in the system are high, no scale will be present. Instead there will be a general dissolution or corrosion of the copper resulting in a high sheen on the inside of the copper tube wall.

The majority of high copper level cases or "blue water" are caused by interaction between the copper tube wall and elements or compounds in the water. To a much, much lesser extent, installation practices or microbial attack can cause or contribute to the issue. The alloy composition of the tube or fabrication of the tube is not normally found to be a factor in high copper level occurrences. This is because the smooth drawing of the tube through the blocks requires a consistent alloy structure. Tubes that may have an inclusion in the tube wall or inconsistencies in the make-up of the alloy tend to collapse, bend, or break during drawing and never get to the marketplace.

Historically, all occurrences of this phenomenon have been loosely, if not mistakenly referred to as cuprosolvency, which literally means dissolution of the copper surface. Classic cuprosolvency typically occurs in water that is relatively soft, low in pH, and high in dissolved gases. It generally is characterized by elevated levels of dissolved copper in the water. However it does not usually result in high levels of particulate copper, or suspended copper corrosion products in the water.

When water chemistries are not consistent with what is described above for cuprosolvency it should be determined whether the water itself has a blue/green cast to it or if there are small malachite particles in the water that are causing the staining. In the latter case, the water quality criteria described above for classic cuprosolvency may not be operative. There may instead be precipitation of bicarbonate and sodium by-products out of the water in such a way as to loosely adhere to the tube wall and react with the copper surface to form a blue/green copper carbonate. This material is very friable and can easily flake off into the water stream when the plumbing system is put into service. It seems to occur most often when water high in bicarbonates has been allowed to stand in the piping system for some time, especially when exposed to high ambient temperatures. For instance, if a house is built and left standing while waiting for completion or occupancy during the heat of the summer months.

In order to try to come to a solution it is important to investigate this phenomenon in an orderly, logical fashion avoiding random testing by different interested parties and hit or miss remedial actions not based on technical data. To that end it is important to get as much information about the particular characteristics and uses of the plumbing system in question.