The New Preservatives

by Theresa Coleman

In 2004, after dominating the market for more than 70 years, wood treated with CCA (chromated copper arsenate) was withdrawn from residential use due to concerns about health risks from arsenic exposure. This created a vacuum that a wide variety of new wood preservatives have since attempted to fill. Some of these treatments have properties that are similar to CCA, but others are more corrosive and require different, pricier hardware and fasteners. Some aren't very corrosive, but aren't rated for ground contact. And for some, whether the lumber is rated for ground contact depends on the size of the material.

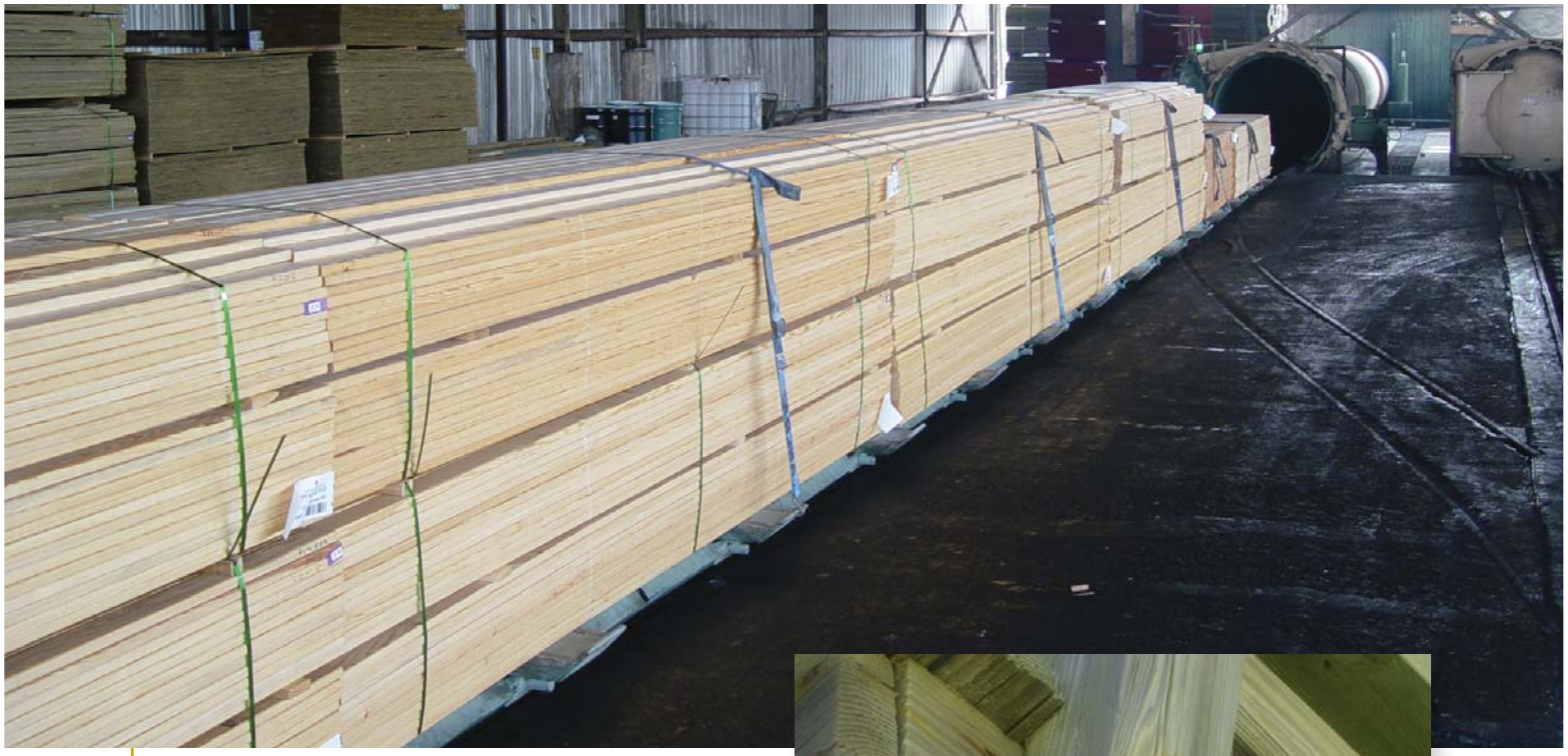
Confused by the alphabet soup of wood-treatment chemicals flooding the industry? Read on.

"It used to be so simple for builders in the United States. All you had was CCA," says Richard Kleiner, director of treated markets for the Southern Forest Products Association. "It was just easier to treat everything with the same amount of preservative, too. You didn't have to worry about aboveground or underground [most treated wood was rated for ground contact]. Now you have to really look at the tags."

First-Generation Replacements

Once the decision was made to take CCA off the residential market, wood treaters had just a year to figure out what to do (see "Why CCA Was Taken Off the Market," a *PDB*Web Exclusive at deckmagazine.com). They turned first to water-based alkaline copper quaternary (ACQ) and copper azole (CA), both of which had been used for many years to treat wood in Europe and Asia. Like CCA, these water-based preservatives leave a dry, paintable surface. Both come with the same type of lifetime warranties as did CCA, and the treatment process is essentially the same — air is pulled out of the wood and liquid preservative is forced in under pressure — just with a different formula.

To protect the wood, both ACQ and CA — like CCA — depend on copper and a co-biocide, which is a chemical added to the formula to kill organisms (such as fungi and insects) that the copper doesn't. In the case of ACQ, the co-biocide is the quaternary compound; in CA, the co-biocide is azole. As with CCA, the copper in both of these preservatives needs some help to dissolve in water to create the aqueous solution that's used to treat the wood. That's



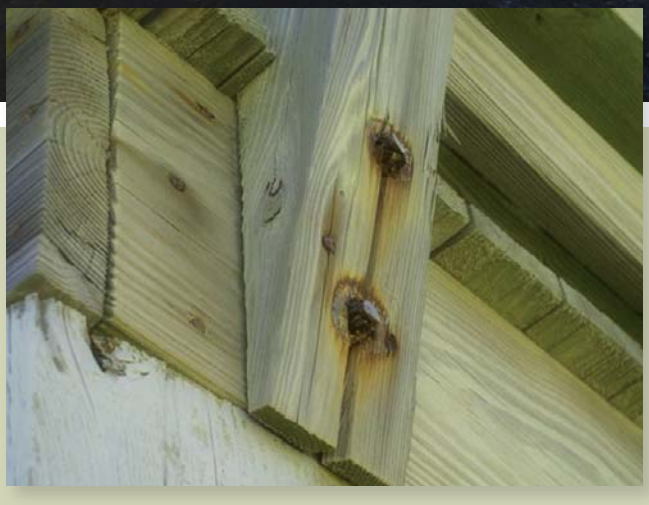


Figure 1. The corrosiveness of the first generation of preservatives to replace CCA took many deck builders by surprise. Lightly galvanized connectors and fasteners, as well as aluminum flashing, often failed in contact with ACQ and CA preservatives.

accomplished by first dissolving the copper in an organic solvent, which is acknowledged as the A (alkaline) in ACQ. CA and CCA use a similar solvent, but it's just not used as part of the product name.

The main downside of these first-generation replacements is they accelerate the corrosion of steel and aluminum fasteners, flashing, and hardware (**Figure 1**). The culprit is the copper in the preservatives, which reacts galvanically with the other metals, resulting in failed connections.

Not only do ACQ and CA have two to three times as much copper as CCA, the form of copper they contain is more chemically active. According to Dr. Jun Zhang, director of Osmose's (800/585-5161, osmosewood.com) Buffalo Technical Center, the copper in CCA binds with the wood, providing relatively few copper ions (the reactive form of copper). The formulation of ACQ and CA, on the other hand, allows for more free copper ions. And unlike CCA, ACQ and CA don't contain chromium, which inhibits corrosion.

The corrosion problem wasn't common knowledge among contractors (or DIYers) at the time of the transition away from CCA, and as a result, a lot of ACQ and CA decks were built with the same G-90 galvanized hardware that had worked with CCA. This led to a well-publicized rash of hardware and fastener corrosion, which in turn prompted manufacturers to produce a new generation of more corrosion-resistant hardware and fasteners.

The other significant issue with ACQ and CA has to do with ground contact. Most CCA lumber was treated to a high enough preservative retention level to allow ground contact, but that's not the case with all of the new preservatives. Because ACQ and CA contain more copper (an expensive commodity) than does CCA, one way for lumber treaters to hold down costs is to treat lumber only to a level appropriate for its likely use. So, post-size — 4x4, 4x6, and 6x6 — lumber is generally treated for ground contact, but most lumber dimensions used for joists, beams, and decking are not. The tag on the end of each board notes the level of preservative retention and states whether that board is allowed

to contact the ground (see sidebar "What Should You Look for on a Treated-Lumber Sticker?" below).

Additionally, ACQ and CA have a greater tendency than CCA to leach copper into soil, because they don't bind with the wood in the same way. Whether that has a negative environmental impact is unclear, though the EPA, which regulates pesticides and fungicides, certainly allows the residential use of ACQ and CA.

Figure 2. The second generation of preservatives, MCQ and MCA, are less corrosive than ACQ and CA and leave the wood looking closer to its natural color.

Next Generation: Micronized Formulas

There's little dispute about the effectiveness of ACQ and CA. But, spurred in part by the corrosion issues, preservatives manufacturers have sought a better formula. The new micronized copper–based preservatives are similar to ACQ and CA in that they rely on copper and the same co-biocides, either the quaternary compound or azole. They're also made by some of the same manufacturers. PhibroWood (800/737-9663, phibrowood.com) makes Sustain, a micronized CA (MCA), and Osmose makes a micronized ACQ (MCQ) called MicroPro.

The difference between the micronized formulas and ACQ and CA is the size of the copper particles. The copper in MCA and MCQ is ground into particles that measure one-millionth of a meter (a micron — thus the name "micronized"). Because the copper particles are so tiny, no organic solvent is needed to dissolve the copper into the water-based treatment solution.

These manufacturers claim that the smaller particles make the formulas more effective and less likely to leach out of the wood. Manufacturers add that less leaching means less bioaccumulation and less chance of toxicity to organisms. And some say that micronized-preserved products look more like untreated wood (**Figure 2**).

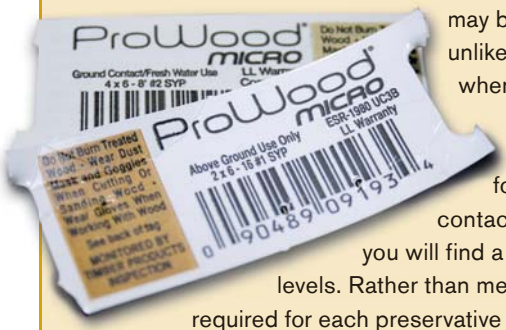
Of greatest interest to deck builders, perhaps, is that these micronized formulas are said to be less corrosive. The manufacturers claim that aluminum and standard G-90 galvanized hardware can be used in direct contact with micronized copper–treated lumber. The reason is that the copper carbonate used in MCQ and MCA produces relatively few copper ions — about the same as CCA, according to Zhang. This is not the case with ACQ and CA, with which aluminum contact is forbidden, and hardware has to be either the thicker, more expensive G-185 galvanized or stainless steel.

That said, while Simpson Strong-Tie (800/999-5099, strongtie.com), a major manufacturer of framing hardware, acknowledges that MCQ is less corrosive than ACQ or CA, it continues to recommend the use of G-185 or stainless steel hardware with MCQ.

Not everyone thinks that MCQ is effective. In May of this year, MicroPro came under attack from

What Should You Look for on a Treated-Lumber Sticker?

The tags at the end of each piece of lumber provide a lot of information. To begin with, the tag should indicate conformance with an AWPA, ICC, or other code-accepted standard for treated lumber. Next should be the use category, which can be UC3B for aboveground use or UC4A for ground-contact use. The name of the preservative is also included; the retention — the amount of preservative injected into the wood — may be noted as well. But unlike the days of CCA, when most of us knew that a retention level of .40 lb. per cubic foot meant ground contact was allowed, today you will find a range of retention levels. Rather than memorizing the levels required for each preservative and use, it's easier to simply look for the AWPA use category or the words "ground contact" or "above ground use."



If you want to dive into the technical aspects of lumber stickers, the description of the AWPA Use Categories, as well as a preservative listing, can be found at awpa.com. — *T.C.*

Viance (800/421-8661, treatedwood.com). Viance makes Ecolife, a nonmetallic, carbon-based preservative (**Figure 3**), as well as ACQ, but it does not manufacture MCQ. Based on findings from a field test done by Viance (and verified by a third party), that company has claimed the MCQ formula does not provide adequate protection against premature decay, particularly in ground-contact wood.

Osmose responds that Viance's test didn't follow the American Wood Protection Association (AWPA) standardized protocols. Gary Converse, senior vice president at Osmose, adds, "Wood treated with the Osmose MicroPro technology has been field tested for over five years for fungal decay and termite attack in accordance with AWPA, ASTM, or other internationally recognized wood testing standards. Furthermore, all field testing has been either conducted or evaluated by accredited independent universities, research organizations, or treated-wood inspection companies. In addition, since the introduction of treated wood incorporating our MicroPro technology in early 2006, more than 3 billion board feet of MicroPro-treated wood has been sold in over 3,000 home centers and lumberyards in the U.S., and there have been no reports or claims of premature fungal decay or termite attack."

Figure 3. Ecolife, Viance's nonmetallic, carbon-based preservative plus wood stabilizing polymer system, has been approved for aboveground and ground-contact applications. The company claims that Ecolife-treated wood can be used in direct contact with aluminum building products. It has a lifetime limited warranty.

Chris Shadday, commercial vice president at Viance, admits that their tests did not follow AWPA protocols but explained the variation: "The AWPA stake test is intended to show how much of a new preservative is needed to resist decay by comparing its performance to a known preservative. Three sets of stakes, one treated with the known preservative, one treated with the new preservative, and one set of untreated stakes to act as a control, are placed in the ground. After a period of months, the stakes are examined for decay.

"To conform to AWPA protocols, the stakes being tested are supposed to be treated at the testing lab with that company's preservatives. Because Viance doesn't make MCQ, we couldn't do that. Instead, we purchased both ACQ- and MCQ-treated 4x4s for testing at local Home Depot and Lowe's stores and ripped them into $1^1/_4$-inch-square stakes. The use of commercially purchased lumber is how our test deviated from AWPA protocols."

Shadday continues, "The lumber we tested was what a contractor might purchase, so we feel the test is valid. We verified that the samples were fully treated on all sides to the claimed level of preservative retention. There would be no point in testing improperly treated wood.

"The decay we found was due to brown and white rot fungi, two common decay-type microbes. It's our theory that the solid, essentially insoluble copper in MCQ is chemically bound and not available in an ionic form, as the soluble copper in ACQ is. Because of this, we don't think that MCQ is as effective at preventing these organisms. We're also concerned that the copper in MCQ doesn't enter the cell walls during treatment, and so won't be as effective at controlling what's called soft rot. However, this rot takes two to three years to develop and our test only ran for about 10 months."

Zhang responds that Osmose has done "a lot of testing in aggressive testing sites. MicroPro performed at least as well as ACQ in independent tests, some that ran for as long as five years." Zhang continues, "MicroPro produces free copper ions at about the same level as CCA, which is above the threshold required to control brown and white rot fungi. And independent labs have observed copper in the cell walls of MCQ-treated lumber using scanning electron microscopes."

There doesn't seem to be a clear answer to this debate. MCQ does offer the contractor one solution to a real problem, hardware and fastener corrosion. And it looks more like untreated wood, which may please your clients. The crux is whether there's substance to Viance's findings of premature decay in MCQ-treated wood. The competitive stakes are

high for both companies, and both Viance and Osmose defend their positions well. What is certain is that time will tell.

Beyond Copper

While some manufacturers worked to improve ACQ and CA, others were looking beyond metallic preservatives, asking what else could preserve wood. "There have been all kinds of developments," says Kleiner, from the Southern Forest Products Association. "There were four new ones added in just the last two years. And I believe you are going to keep seeing even more preservatives."

The trend in this group of up-and-comers is to preserve wood with little or no metal in the formula. "I can tell you that there are a lot of products out there; most are AWPA standardized, but some are not," says Colin McCown of the AWPA. "A buyer would need to look for the AWPA mark on the treated wood to ensure that they're using products standardized by experts in the field of wood protection in an open, consensus-based process."

This means that if your local municipality allows, there may be treated wood available to you that hasn't yet been approved by the national regulators. Additionally, some approved new formulas are not intended for ground-contact use.

Borates, for example, have long been used to preserve regular framing lumber in particularly termite-prone areas such as the deep South, and as an indoor pesticide (borates are nontoxic to humans). As a supplemental architectural preservation method, borate pellets are often placed in holes drilled in existing exterior trim. Borate treatment generally increases the fire resistance of wood and isn't corrosive. Borates are water soluble, however, and tend to leach from wood that's used outside.

Until recently, no major application using borates had been approved for exterior use. That changed with the advent of EnviroSafe Plus (**Figure 4**), made by Wood Treatment Products (800/345-8102, eswoodtreatment.com). ICC approved for aboveground use, the borates are locked into EnviroSafe lumber with a combination of polymers and stabilizers that are forced into the material during pressure treatment. Jack Rombough, president of the company, says that EnviroSafe Plus is currently distributed in some Southeast, Middle Atlantic, Midwest, and Southwest states.

Figure 4. EnviroSafe Plus is a borate-based aboveground preservative treatment approved by the International Code Council and accepted by the EPA. Lumber is pressure treated with DOT (disodium octaborate tetrahydrate) and a water-repellent polymer. Fire retardant and virtually noncorrosive, the product comes with a 40-year transferable limited warranty.

TimberSil (888/346-9200, timbersilwood.com), which uses sodium silicate — essentially glass — to preserve the wood, claims its preservative can be used both in ground contact and above ground, and that it strengthens the wood (**Figure 5**). The company also claims its product is noncorrosive and a Class A fire retardant, which could be a great benefit in areas prone to wildfire.

While it currently lacks ICC approval, TimberSil's resistance to termites has been confirmed by the New Orleans Mosquito and Termite Control Board. Lew Combs, marketing director for TimberSil, says that he expects to have ICC approval within six months, and that building inspectors throughout the country have been allowing the use of TimberSil based on current documentation.

Initial problems with third-party treatment plants slowed TimberSil's introduction to the market, and distribution has been spotty. However,

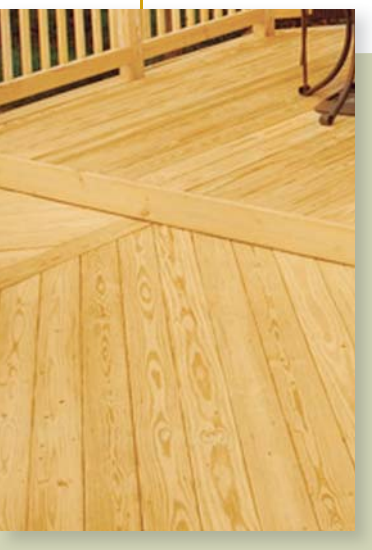


Figure 5. TimberSil's heat treatment process infuses microscopic silicone-based glass crystals into wood to protect it from decay and infestation. Because the USDA has deemed that TimberSil does not fall into its treated category, TimberSil is not approved by the International Code Council. But it has been approved by the EPA as a nontoxic exempt barrier product. The company claims it can be used in both ground-contact and aboveground applications. It carries a 40-year transferable warranty.

Figure 6. To create PureWood, heat is used to convert sugars in wood to a form that's unpalatable to fungi and termites, thereby protecting it from rot. It is a nontoxic process and the wood is free of added chemicals. Approvals are pending.

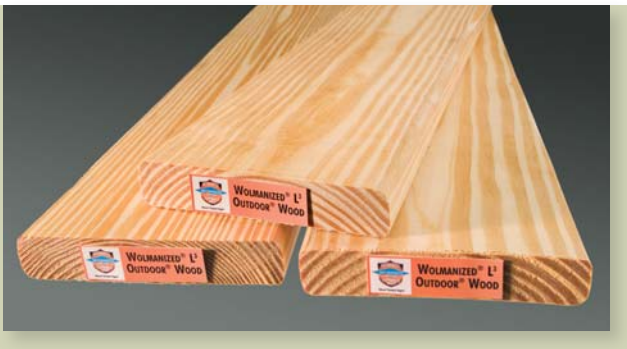


Figure 7. Intended for aboveground use, the nonmetallic Wolmanized L3 wood has been evaluated by the International Code Council and is listed in the *AWPA Book of Standards.* The company adds a pigment to its formula to distinguish its light brown treated lumber from other types of treated lumber. It is backed by a lifetime limited warranty.

Figure 8. ProWood Micro is a micronized copper quaternary preservative from Osmose. It's available with the company's integral pigment system, called MicroShades, which adds wood-tone colors. ProWood Micro has earned Environmentally Preferable Product (EPP) certification from Scientific Certification Systems. To earn EPP certification, a product must demonstrate reduced impact on human health and the environment when compared with other products that serve the same purpose, as measured by guidelines published by the U.S. EPA.

TimberSil recently signed up with American International Forest Products and is now available nationwide. Production at TimberSil's West Coast plant has gone from one shift to three, and an East Coast plant is in the works for 2009.

Fungi and termites attack wood because the sugars it contains are their food source. Bay Tree Technologies' PureWood (888/575-4180, purewoodproducts.com) preserves wood by taking the sugars out (**Figure 6**). No chemicals are added — the wood is heated using a process developed by the Finnish company Stellac Oy (stellac.fi/English/stellac.htm). Woods treated in this manner are noncorrosive and take on a toasty brown color, but they do lose some strength in the process.

According to Ron Long, president of Bay Tree, PureWood is currently available in 13 southern and midwestern states. Long says that agreements should be in place by the time this article is published that will improve distribution in the South and West. He predicts similar distribution increases in northern markets for 2009. PureWood does not yet have full code acceptance, but Long expects to have reports from ICC-accredited labs within four months. He adds, "In actual application, we haven't encountered any resistance from local inspectors."

Arch Treatment Technologies (770/801-6600, archchemicals.com) has moved away from metal-based preservatives with its Wolmanized L3 treating solution (**Figure 7**). Accepted by the ICC for aboveground use, Wolmanized L3 is a carbon-based preservative that's said to be noncorrosive to metals. According to company spokesman Huck DeVenzio, L3 is currently available mainly on the East Coast and in the upper Midwest.

In addition to developing new formulas for preserving wood, some manufacturers are trying out a new look by using built-in stains. ProWood Micro with MicroShades from Universal Forest Products (800/598-9663, ufpi.com), for instance, combines an MCQ-based preservative with integral pigments to add natural wood-tone colors to its decking and fence products (**Figure 8**). ❖

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