Pressure-Treated Wood: The Next Generation

by Ted Cushman

Today's treated-lumber producers promise good protection with less corrosion, but the jury is out on long-term performance

For more than half a century, pressure-treated wood was a simple material to understand and purchase. Most of the PT lumber used in residential work was treated with chromated copper arsenate, or CCA. Most of the rest was treated with ammoniacal copper zinc arsenate, or ACZA. Different suppliers used different brand names, but all the wood — CCA and ACZA — looked, handled, and performed about the same.

And the performance was good: While treated lumber might check, splinter, or warp from the effects of weathering, it generally wouldn't rot or get eaten by termites. This has been confirmed by decades of field experience as well as testing by manufacturers and the U.S. Department of Agriculture Forest Products Laboratory.

In both ACZA and CCA, the main preservative is copper — which, in high enough concentrations, will suppress or kill most kinds of fungi and insects but doesn't hurt people or pets. The arsenic in both formulas serves as a "co-biocide"; it controls a few copper-tolerant fungi that would otherwise attack the wood and puts the final nail in the coffin of termites and other wood-eating bugs. The chromium in CCA and the zinc in ACZA are there primarily as binders — they help lock the copper and arsenic into the wood by "fixation," which means that they form chemical bonds between the biocides and the wood fibers.

The big difference between CCA and ACZA is the carrier: CCA uses mostly water, whereas ACZA includes an ammonia solution to help it better penetrate some hard-to-treat Western softwood, like Douglas fir.

Up until the 1990s, treated wood was treated wood. But a few years ago, all of that changed. The chemical companies that supplied the lumber treatments were facing increasingly negative publicity about their products, particularly in regard to the potential exposure of children to arsenic in backyard structures and playground equipment. While no public health threat from pressure-treated wood has ever been clearly established, arsenic is listed as a known human carcinogen

by the EPA and the International Agency for Research on Cancer (IARC), and the resulting bad press and threat of lawsuits proved to be impossible for wood treaters to overcome. In 2003, the leading chemical suppliers for the wood-treating industry decided to compromise and entered into a voluntary agreement with the EPA: In 2004 they would stop selling preservatives containing arsenic and chromium to residential lumber treaters and switch to new formulas for residential applications.

This new policy set the stage for an ongoing parade of new treated-wood products and formulas (see table, facing page). First up was ACQ — ammoniacal copper quaternary or (depending on the carrier used) alkaline copper quaternary. This formula keeps the relatively benign copper but replaces the arsenic and chromium co-biocides with a quaternary compound, or "quat."

Compared with arsenic, quat is pretty mild stuff; it's basically a sanitizing soap based on ammonia. Quats are a universal ingredient in shampoo, for example. And the typical quat used in ACQ, known as "DDAC," for didecyl dimethyl ammonium chloride, is also an active ingredient in household products like Mr. Clean sanitary wipes and Febreze antimicrobial fabric freshener.

The other early entry was copper azole, or CA — which, like ACQ, has copper as the primary fungicide and insecticide, but uses carbon-based "azole" compounds called tebuconazole and propiconazole to do the job of arsenic. The azoles are pesticides, widely used in agriculture to control insects and fungi. Unlike arsenic, azoles are approved by the EPA for use on food crops. Seed treating is a common use for azoles; in California, the biggest users of tebuconazole are grape growers who spray it on their plants.

So there's no question about it: ACQ and CA have fewer scary ingredients than CCA. But in use, they turned out to have a few significant drawbacks. The new treated boards and timbers had significantly higher copper content than the older CCA-treated wood, and they tended to leach a lot of copper. That heavy leaching, along with the surfactant action of the quat components and the "amine" carrier (ammonia or alkaline), has been blamed for leaving greenish stains on painted surfaces — for example, where water runoff from a deck flows onto trim or siding.

In addition, says wood scientist and consultant Mike Freeman, the amine carrier used to dissolve the copper in ACQ and copper azole turned out to be an excellent mold food. "The plants that converted over in 2002 and 2003 had a huge mold crisis," says Freeman. "Millions of dollars' worth of wood almost had to be destroyed — or at least rewashed or retreated with moldicide. The levels of moldicide that were used with CCA just did not work well on the amine-based formulations."

The most significant problem, however, was the effect of ACQ and CA on metal. The high levels of free copper that remain in the wood had a strong tendency to corrode fasteners, hardware, and flashing.

Corrosion Concerns

No sooner did ACQ hit the market in 2004 than complaints started to pour in. According to Freeman, building code officials got 6,000 complaints about fastener or hardware corrosion in the first year after CCA was withdrawn. Some of those complaints may just reflect closer scrutiny, says Oregon Department of Transportation engineer Quentin Smith, who's chairing an ASTM committee on fastener corrosion standards: "It's possible that people are just paying more attention then they used to, and that the corrosion's not actually any worse than it was."

But objectively, there's no disputing that ACQ and CA are more destructive of metal than CCA is. In comprehensive testing using methods standardized by the American Wood Protection Association (AWPA), New Zealand researcher Gareth Kear and his colleagues found that "ACQ-treated timbers are more corrosive towards mild steel and hot-dipped galvanized steel than any other type of treated timber." ACQ wood corroded mild steel about five times as fast as CCA did, and corroded hot-dipped galvanized steel anywhere from five to 19 times as fast. Galvanized steel lasted longer than mild steel, but only stainless steel held up without significant damage: "The 316 stainless steel performed very well in terms of corrosion resistance within all of the preservative treatments examined," reported the researchers.

In response to the increased corrosion and other problems associated with ACQ and CA, within just four years of their introduction these second-generation formulations were largely replaced by a newer generation of "micronized" — or "dispersed" — formulas with names like micronized copper azole (MCA), micronized copper quat (MCQ), and dispersed copper azole (μCA). As of 2008, says Freeman, MCA, MCQ, and μCA accounted for 80 percent of the residential market, with ACQ and CA squeezed down to 20 percent or less.

These new third-generation formulas contain copper in the form of very finely ground particles, rather than in dissolved form. They don't need the nitrogen-rich amine carrier, and because they are less prone to leaching, they can be treated with less total copper and still maintain adequate long-term concentrations. Manufacturers also claim that these formulas are less corrosive to fasteners. Osmose, for instance, says that its SmartSense treated

Table 1. Treated Wood: What's on the Menu?

Compared with the good old days of the 1980s and '90s, when treated wood was treated wood, today's marketplace offers a wide — and sometimes confusing — array of choices. Here's a short list of the products generally available today.

Arsenic-Containing Formulas
Contractors can still get old-style arsenic-based treated wood for certain uses. Here's what you might see:

Abbreviation	Generic Name	Trade Name	Manufacturer	Web Site
CCA	Chromated copper arsenate	Wolmanized Heavy Duty	Arch Wood Protection	wolmanizedwoodhd.com
		SupaTimber	Viance	treatedwood.com
		CCA	Osmose	osmosewood.com
		CCA	Hoover Treated Wood	frtw.com
ACZA	Ammoniacal copper zinc arsenate	Chemonite	Arch Wood Protection	chemonite.com

Dissolved Copper-Based Formulas
The primary preservative ingredient in these early CCA replacements is dissolved copper.

Abbreviation	Generic Name	Trade Name	Manufacturer	Web Site
ACQ-A or ACQ-B	Ammoniacal copper quaternary	NatureWood	Osmose	osmosewood.com
		Preserve	Viance	treatedwood.com
ACQ-C or ACQ-D	Alkaline copper quaternary	NatureWood	Osmose	osmosewood.com
		Preserve	Viance	treatedwood.com
		Dura-Guard	Hoover Treated Wood	frtw.com
CA-B or CA-C	Copper azole	Wolmanized Residential Outdoor	Arch Treatment Technologies	wolmanizedwood.com

Copper Suspension–Based Formulas
Called "micronized" by one vendor and "dispersed" by another, these are the newer formulas based on finely ground copper particles suspended in water, instead of (or in combination with) dissolved copper.

Abbreviation	Generic Name	Trade Name	Manufacturer	Web Site
µCA-C	Dispersed copper azole	Wolmanized Residential Outdoor	Arch Treatment Technologies	wolmanizedwood.com
MCA	Micronized copper azole	Sustain	PhibroWood	www.phibrowood.com
		LifeWood	Osmose	osmosewood.com
MCQ	Micronized copper quaternary	MicroPro	Osmose	osmosewood.com

Carbon-Based Formulas
These systems contain no copper or other metals, but rely on combinations of insecticides and fungicides already approved for use in agriculture. So far, no carbon-based systems are listed for use in ground contact.

Abbreviation	Generic Name	Trade Name	Manufacturer	Web Site
EL2	DCOI & imidacloprid	Ecolife	Viance	treatedwood.com
PTI	Propiconazole-tebuconazole-imidacloprid	Wolmanized L^3	Arch Treatment Technologies	wolmanizedwoodL3.com

wood with MicroPro, a micronized copper quaternary formula, "exhibits corrosion rates on metal products similar to CCA pressure-treated wood and untreated wood."

Peter Laks, a professor at the School of Forest Resources and Environmental Science at Michigan Tech, confirms that there is a lot of test data to support this claim. "It also just makes sense from the chemistry," he says. Dissolved-copper systems leave lots of free copper ions in the wood that act to corrode other metals like steel, zinc, or aluminum, he explains. Moreover, the amine carrier — ethanolamine — that is used to help dissolve the copper "is inherently quite a corrosive material," he says.

The micronized approach, says Laks, uses a "very different kind of protection mechanism" that avoids the corrosive effects of ethanolamine. The active ingredient, finely ground particles of copper carbonate, has a low level of water solubility. "Those particles penetrate through the micro-pore structure of the wood and then just reside within the wood structure ... so that when the wood gets wet, a tiny little bit of that copper carbonate particle dissolves and diffuses into the cell wall of the wood and protects it."

Product Labels

Any new lumber treatments — including micronized products — have to run a tough gauntlet in order to be accepted by the code and the marketplace. There are two pathways to gaining code acceptance. One is to get "standardized" by the AWPA; the other is to acquire an evaluation report, or ER, from the International Code Council Evaluation Service (ICC-ES). While both listings are expensive to obtain, either one — plus continual inspections by an accredited agency like the Southern Pine Inspection Bureau — qualifies the product to carry an identifying plastic tag, stapled to the end of the board, with information contractors can use to choose their lumber. In addition to the inspector's logo, the tag lists an AWPA "use category" or an ICC "exposure category" that tells the builder where the material is safe to use (see "Read the Label," page 41).

To bring their products to market, some manufacturers will obtain an evaluation report first, because the process is faster, then later add or replace it with the AWPA listing, which requires more years of test data and is considered by some industry insiders to be a more rigorous method of certification. For example, while MCQ has received an ICC evaluation report, its manufacturer, Osmose, has not at this time applied for an AWPA listing. The two other manufacturers of micronized lumber, Arch Treatment Technologies and PhibroWood, are working to obtain AWPA listings for their products.

Continuous in-ground stake testing of traditional CCA lumber goes back 70 years. Newer formulations are holding up under similar testing, but some have only a four-year to 10-year track record.

Long-Term Performance

Not everyone is convinced that the new micronized products are an improvement over the older solubulized versions. Their chief critic is ACQ manufacturer Viance, which has charged that MCQ-treated posts buried in the ground suffered extensive decay in testing funded by Viance. Manufacturers of micronized products counter that Viance's studies are biased and not representative of the MCQ products they are selling.

With formulas changing so rapidly, can contractors rely on the labeling to ensure that the wood is going to survive as well as the old CCA lumber? Yes and no, say experts. Stan Lebow, the Forest Products Laboratory's top authority on treated wood, says, "There's just no way we can have as much confidence in the newer formulations until they've been in service for many decades. This doesn't mean they're not effective — it just means there's no substitute for real-time, in-service experience."

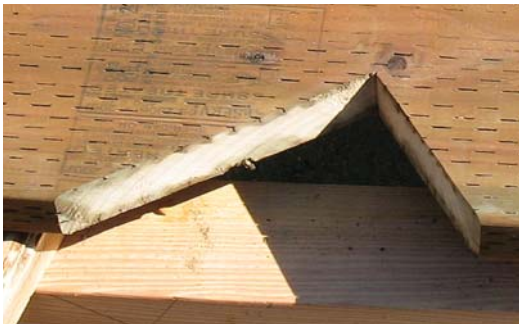
What we can do, says Lebow, is look at factors we know are relevant to the lumber's performance, such as the treating chemical's lab-established potency against bugs and rot. "All the new formulations have shown efficacy in these tests, and concentrations used [to treat lumber

in the market] are above those thresholds," he notes. "Unfortunately, it's impractical to make these determinations for all types of wood-attacking organisms, so the tests are typically run against a subset of the most common organisms."

Leaching of preservatives is another factor that's hard to assess, Lebow points out. "All the newer formulations do have some mechanism of stabilizing the preservative in the wood, although it's a different mechanism than for CCA. As with decay and insect testing, we are not yet able to confidently apply the results of our laboratory leaching tests to predict leaching in real-world exposures."

Varying exposure conditions in the real world also complicate performance. "We know the same piece of treated wood will last much longer in Montana than Florida, and much longer above ground than in ground contact," says Lebow. "But we don't know exactly how much longer." Throw in rain, snow, sun, leaf and plant litter, or salt air, and the long-run performance of a piece of wood is hard to predict.

And keep in mind, says Lebow, that treating chemicals — whether CCA, ACQ, or the newer types —may not penetrate to the heartwood of large timbers, especially in hard-to-treat Western wood species. So when you cut posts or beams in the field, especially for a structurally important role, you should field-apply a preservative to the cut end. Copper naphthenate (with at least a 1 percent concentration of copper) is the most common formula for that, says Lebow.



Photos by Mac MacDonald

Although incising helps, treatments often do not penetrate to the center of a timber (top left) or even a 2-by member (top right). Experts recommend field-treating all cuts with a copper-based penetrating wood preservative such as Jasco Termin-8 or Wolman's CopperCoat (above).

Hardware Choices

At this point, the IRC allows only four fastener materials for use with any copper-based preservative treated wood: copper, silicon bronze, stainless steel, and hot-dipped galvanized treated according to ASTM Standard A153 (steel bolts 1/2 inch or greater in diameter are excluded). Of these, only stainless steel and galvanized steel are widely available. But effective this year, the ICC-ES has published an updated "Acceptance Criteria" — AC257 — that will allow other fasteners to earn evaluation reports qualifying them as alternatives to the accepted fasteners.

The AC257 standard involves driving the test nails being tested into pieces of treated lumber alongside hot-dipped galvanized nails, placing the pieces into a saltwater spray chamber, and then comparing the results, both visually and by weighing.

There are already hundreds of fasteners on the market — with a variety of ceramic, phosphate, polymer, and mechanically plated or electroplated zinc or other metal coatings — that are advertised as "approved for" or "compatible with" treated lumber. At this time, it's up to the buyer to ask what testing was done and what approvals are in hand. But

now that AC257 is in effect, many of these products are likely to gain their building code Evaluation Service listings in the next year or two.

Even before the development of the AC257 test, some fastener makers were working hard to demonstrate that their products were compatible with ACQ lumber. Take FastenMaster's popular LedgerLok structural screw (fastenmaster.com), which is used to attach deck ledgers and make structural connections. LedgerLok is made of heat-treated carbon steel with a zinc plating plus an epoxy and Teflon surface coating. The product does carry an ICC evaluation report, ESR-1078, which you can download from the company's Web site or from the ICC site (iccsafe.org). But that report addresses only the screw's structural strength — it specifically states, "This evaluation report does not address fastener corrosion when the fastener is installed in chemically treated wood."

Nevertheless, FastenMaster endorses the use of LedgerLok screws with ACQ lumber or any other treated wood, except in coastal locations within 1,000 meters of the ocean. That recommendation, says FastenMaster technical manager Mark Guthrie, is based on an older accepted test method for corrosion in metal fasteners and hardware, AWPA Standard E12. LedgerLoks and other FastenMaster coated screws were tested according to the E12 protocol in a lab at Michigan Tech: Ten fasteners were screwed into untreated lumber, CCA wood, and two types of ACQ wood; then the wood samples were exposed to salt solution and heat in a corrosion-acceleration chamber. Compared with galvanized lag bolts and galvanized nails, the LedgerLok screws showed no visual deterioration in the coating and lost less than 1/2 percent of their original weight.

And, says Guthrie, who handles callbacks for FastenMaster, field results bear out the testing: He has never seen a LedgerLok screw with significant corrosion in any kind of treated lumber in actual use conditions. Guthrie says that FastenMaster is pursuing the process of getting the LedgerLok tested under the new ICC standard AC257. But he says it may take a while: "There are very few labs currently set up for it."

Within a year or two, though, contractors should have a reasonably wide selection of approved fasteners to choose from, backed by ICC evaluation reports. But will those fasteners hold up in service on your deck? There's no way to really know, says John Kurtz, executive vice president of the International Staple, Nail, and Tool Association (ISANTA). Kurtz has been working for years with committees trying to develop testing standards for fastener corrosion in treated wood. "Corrosion is a very complex subject, and there are many variables," he says. "No one has figured it out well enough to be able to say, this behavior in a test will translate into three years or 12 years or 100 years of performance in a particular exposure in a particular part of the country or climate. It's a best effort, but there is no guarantee."

The best rule for anyone willing to pay the price of caution is probably this: When in doubt, use stainless steel. All the research testing shows that Type 304 and Type 316 stainless steel are practically immune to corrosion by any kind of copper-treated wood.

Simpson Strong-Tie, for example, advises stainless steel for any coastal exposure, or any situation where there might be an unusual chemical stress (such as next to swimming pools, where chlorine may be a factor). Simpson's Ed Sutt looks at the judgment call this way: "You need to weigh where it is important to get the job done and where it is important to do the best job. So, for instance, if you're in a harsh environment and you don't want to spend the money for stainless on the whole job, maybe that critical ledger connection is where you should consider using stainless, to reduce the risk. Or where you attach handrails — that's not the place to save money. But when you are attaching the deck boards, maybe that's the place where you want to save money — because that's not necessarily as critical."

Hangers and Connectors

AC257 is the ICC test standard for nails and screws in contact with treated lumber. So far, there's no comparable test for hardware connector straps, joist hangers, or post bases, and no way for hardware suppliers to get specific code listings that apply to using their product with treated wood. For now, contractors have to rely on the recommendations of the wood treaters and the hardware makers. Simpson's advice, based on extensive testing, is posted online at strongtie.com/productuse/selection-guide.html. For USP's guidance, see uspconnectors.com/corrosion.shtml#guidelines.

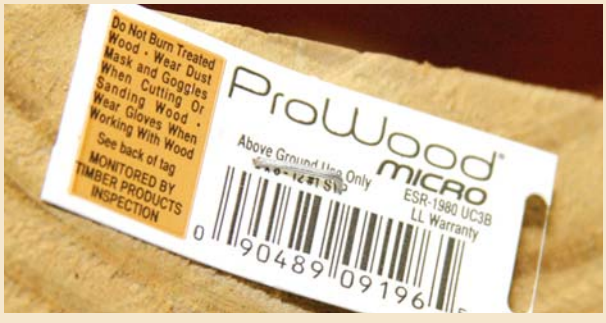
In essence, the manufacturers call for increasing corrosion protection as exposure conditions grow more harsh. In protected dry locations, they recommend G-90 galvanized hardware (with a coating of .90 ounces of zinc per square foot of surface area). For wet exterior locations, this gets bumped up to a G-185 galvanized product (with 1.85 ounces of zinc per square foot), such as Simpson's Zmax product line or USP's Triple Zinc line. But in severe exposures (including, says Simpson, "exposure to ocean salt air, large bodies of water, fumes, fertilizers, soil, some preservative treated woods, industrial zones, acid rain, and other corrosive elements"), the recommendation is for Type 303, 304, 305, or 316 stainless steel connectors and fasteners.

Simpson's "high exposure" category, it's worth noting, includes some types of treated wood — such as formulas

Read the Label

Like everything else about treated wood, the plastic labels stapled to the end of each board have been changing. Until recently, the end tags carried information about the "retention level" of the treating chemical in the wood. That practice started back in the days of CCA, when most wood in the lumberyard was rated for ground contact and treated to a retention of .40 pounds per cubic foot. Now, however, retention levels vary from one chemical treatment to another and by lumber dimension. Because of the high cost of the new treatments, manufacturers typically use less chemical in, for example, decking boards or 2-by lumber than in 4x4s, which are more likely to be used in contact with the ground.

Accordingly, most suppliers now leave retention levels off the tag, preferring instead to simply recommend where the piece of wood should be used. (You can still find out the retention level by contacting the treatment company directly or by downloading the product's evaluation service report, or ESR, from either the company's Web site or the ICC Web site: icc-es.org/reports. ESR numbers are supplied on the lumber end tags.)



Treated-wood end tags identify the brand of lumber, provide an evaluation service report number, and specify Above Ground, Ground Contact, or other permitted uses.

Retentions aside, even the usage labeling can be a little confusing. There are actually two systems for listing the allowable use conditions for treated wood. The American Wood Protection Association (AWPA) has a system of "Use Category" designations. Lumber stamped UC3A, UC3B, or UC3C, for instance, is approved for above-ground applications, while UC4A and UC4B indicate ground-contact applications. The International Code Council, by contrast, has chosen to go with basic descriptive words: Decking Use, Ground Contact, and Above Ground are the labels applied to almost all lumber you'll see stocked at a lumberyard, often along with the AWPA designation. Lumber with heavy treatment retentions can be labeled Foundation Use or Marine Grade.

For deck builders, the new system can cause problems. Jim Finlay, who operates an Archadeck franchise in suburban Boston, explains: "Pretty much all CCA lumber used to be certified for ground contact. But with ACQ, only the large timbers — the 4-by dimension lumber and larger — is certified for ground contact." That's fine in most applications, says Finlay, but sometimes he needs to build a ground-level deck that requires a support beam placed at or below existing grade. In that situation, he says, "we dig out a slot in the ground, fill it with crushed stone, and put our beam on top of a concrete footer."

To get 2-by lumber for a built-up beam that's rated for ground contact, says Finlay, he has to special-order the pieces. "I have yet to find a lumberyard where I can walk in and buy a 2x8 or 2x10 rated for ground contact," he says. He is also still able to special-order CCA-treated 2-by stock for that application.

Ground contact, says wood scientist Mike Freeman, is by far the toughest exposure. "The wood is much wetter," he notes, "and there are also increased fungal populations in the ground." The ground line, he says, "is the No. 1 area where utility poles fail in the United States, and that's the same for deck posts." So contractors need to be sure they're using the wood in accordance with its labeled exposure category — and be especially sure that they're not putting wood labeled for above-ground use in contact with the earth.

On the other hand, says treated-wood expert Peter Laks, you don't want to use more heavily treated wood than is required — at least not the copper-based products like ACQ or copper azole. Since wood rated for ground contact has more copper in it than wood rated for above-ground use, it's not only more expensive — it's also more likely to corrode steel and aluminum and to interfere with paints and stains.

containing a lot of ammonia, or wood that has been treated to unusually high retentions. Quality control is an important factor in the corrosiveness of treated lumber; if a given batch has more chemical than usual or has not dried fully, for instance, it could be rougher on fasteners. There may not be any easy way to determine this, unfortunately — so if you're thinking conservatively, you may want to go ahead and spend the money for stainless steel.

Looking to the Future: Beyond Copper

While copper is a highly effective wood preservative — without the severe toxicity of arsenic and chromium — it's not necessarily the last word in wood preservation. For one thing, it's got its own environmental issues; in fact, three countries in Europe have already outlawed copper-based wood preservatives because of copper's toxic effect on some aquatic life.

Many U.S. companies are looking beyond micronized copper and working on new formulas that contain no copper — or any other metal, for that matter. For example, there are carbon-based formulas, made up of combinations of commercially available fungicides and insecticides originally developed for agriculture and already approved by the EPA for use by farmers. And there are borate-based formulas, mostly designed for use in dry indoor locations, but including one system approved for outdoor use above ground.

Carbon-based formulas. When they first hit the market, the carbon-based wood preservatives were called "organics." Fair enough: Complex carbon polymers are known in chemistry as "organic molecules" and the science of making them is called "organic chemistry." But confusion arose about the other, completely opposite meaning of "organic" in the marketplace — the one that refers to natural farming without the sort of chemical pesticides used in these formulations. So the EPA told wood treaters to find another term, and the marketers came up with the less controversial "carbon-based."

So far, there are two carbon-based brands on the market: Ecolife, from Viance (treatedwood.com), and Wolmanized L^3, from Arch Treatment Technologies (wolmanizedwoodL3.com). Ecolife uses the insecticide imidacloprid, paired with the fungicide DCOI, commonly called isothiazolone. L^3, pronounced "L-cubed," also contains imidacloprid, but with the same "triazole" fungicides used in Arch's copper azole product, tebuconazole and propiconazole. So far, neither carbon-based brand is listed for ground-contact applications, although at least one vendor is reportedly working on getting that listing.

As a rule, carbon-based preservatives are much less corrosive than copper-based products. (The carrier used to dissolve the chemicals, however, might still be corrosive, cautions Mike Freeman.) Another big advantage of carbon-based products is appearance. They start out the color of natural wood, and they're easy to paint and stain. But those benefits haven't proven as popular as the vendors had hoped. "I thought people would jump at the chance to have a carbon-based preservative in their wood, and sales have been okay, but not as great as I expected," says Arch executive Huck DeVenzio. "I do think it's the wave of the future," he adds.

Ironically, some customers seem to miss the green tint they associate with traditional treated lumber. "Some customers wanted the wood to have some color so they could tell the difference between treated and untreated wood," says Freeman. "They want that green shade. And guess what the treaters are using to tint the wood? Copper."

On the other hand, for uses where paintability is key, the neutral color is a plus. "People making molding and trim love it," says DeVenzio. "People who make outdoor furniture, or storage sheds — they really like the natural look too."

Borate-based formulas. The other new entry into the field is preservatives based on boron, a mineral that effectively controls both insects and fungi and is widely considered benign to humans and other mammals. Experts say borate is no more toxic to humans than ordinary table salt; homeowners can buy nearly 100 percent pure boric acid off hardware-store shelves in the form of roach-control products like Roach Prufe.

All three of the big players in wood treating have borate-based products for above-ground applications protected from the weather: Arch's SillBor (sillbor.com), Osmose's Advance Guard (osmosewood.com), and Viance's TimberSaver (treatedwood.com). But because borates are very water-soluble and readily leach out of wood, none of those products are effective for outdoor use. After just one season in the rain, preservative levels would be too low to protect the lumber.

More appropriate for deck builders is a product called ES+Wood, from Wood Treatment Products, (eswoodtreatment.com). This treatment uses disodium octaborate tetrahydrate, a water-soluble borate compound, plus a penetrating polymer binder that seals the borate into the wood and keeps it from leaching out. ES+Wood is not code-approved for ground contact, but it's available for use as deck framing, decking, railings, and trim, as well as playground and recreational equipment. It carries a 40-year transferable warranty (limited to materials only) against damage by termites or fungal decay.

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