

BY SCOTT GIBSON

For 60 years or so, a compound called chromated copper arsenate (CCA) successfully protected structural lumber from the harmful effects of weather, bugs, and microbes. Eased off the consumer market at the end of 2003 due to concerns about its toxicity, CCA was replaced by two other compounds also rich in copper but without the arsenic or the chromium: alkaline copper quaternary (ACQ) and copper azole (CA). Now, nearly four years later, they remain the only residential choice for treated wood rated for ground contact.

Technology in lumber treatment is moving forward, however. Manufacturers are working hard on more-benign organic compounds that not only eliminate the corrosive effects of traditionally treated lumber products but that also can be used directly in the ground.

Until that technology is ready for market, three effective structural materials can be used when mold, insects, and decay are a concern. Each has varied applications, levels of protection, and price differences.

Copper-based ACQ and CA are highly recognizable materials that continue to dominate the preserved-wood industry. Borate-infused lumber is not a new technology, but it is a fast-growing, nontoxic alternative to metal-based treatments. And plastics, which typically have been thought of only as decking material, are emerging as another viable structural material.

Each material has significant strengths and weaknesses that are important to understand before being incorporated in any type of building project.

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Reconsidering Rot-Resistant Framing Material

Copper- and borate-based preservative treatments have proven effectiveness, but structural plastics are more durable and are made from recycled materials

ACQ/CA Alkaline copper quaternary/copper azole

Modern copper-based treatments
are less toxic but highly corrosive



ACQ and CA are the two copper-based compounds that have been the industry standard for residential use since chromated copper arsenate (CCA) was phased out in 2003. Readily available, ACQ- and CA-treated lumber products have established a reliable track record of protection against moisture, mold, and insects, as well as endured the effects of direct ground contact. Don't be misled, though: Not all copper-based treated wood is intended for in-ground use. Copper-rich preservatives are forced into wood with various retention levels depending on the lumber's intended end use. A label attached to each piece of lumber specifies the wood's proper application. (See *FHB* #160, p. 83.)

The transition from CCA to ACQ and CA has not been seamless. Eliminating arsenic and chromium reduced treated lumber's toxicity but significantly increased the wood's corrosive effect on steel fasteners and hardware, as well as on some types of flashing.

Copper corrodes steel—like nails and joist hangers, for example—through a process known as galvanic corrosion. When these two dissimilar metals come in contact and are exposed to moisture, the less-resistant, more-active metal (steel) becomes anodic and literally is consumed by the cathode, or the stronger, more-noble metal (copper).

The increased levels of copper also have made ACQ and CA lumber more expensive, and the absence of chromium allows more copper to leach into the environment. That's a problem for aquatic organisms, and it could lead to government restrictions in the future. As a result, the industry sees ACQ and CA as a step on the way to third-generation treatments.

Best uses: Sill plates, decks, landscape ties, and outdoor structures

The Good

- Readily available at lumberyards and home centers.
- An able successor to CCA lumber. Suitable for both aboveground and in-ground applications.

The Bad

- Builders required to use pricier hot-dipped galvanized or stainless-steel hardware.
- Overall effect on the environment is still unknown, so disposal is a concern.

Cost

2-in. by 6-in. by 8-ft. stud: \$8
6-in. by 6-in. by 8-ft. post: \$22
4-ft. by 8-ft. by ½-in. plywood: \$38

Sources

NatureWood
www.osmose.com
ProWood ACQ
www.ufpi.com
Wolmanized Outdoor Wood
www.wolmanizedwood.com

BORATE

This naturally occurring mineral salt is a great wood preservative in dry environments

Borate is absorbed easily into wood fibers, making it ideal for treating lumber. Borate also has a proven history as an effective agent against mold, wood-destroying microbes, and insects like the Formosan termite.

Among its positive qualities, borate can be infused in the array of lumber used in construction, including I-joists, 2x studs, sheathing, and even LVLs.

Borate has one serious fault, however: a tendency to leach out of wood under frequent water exposure. This quality makes borate unsuitable for outdoor or in-ground use. According to some manufacturers, though, brief job-site storage—up to six months—won't affect the lumber's protective quality.

Efforts to fix the leaching problem are under way. "The holy grail of wood preservation is a borate that's nonleachable," says Tor Schultz of Mississippi State University's College of Forest Resources. "In the lab, borates can be modified so that they won't leach out of the wood, but as permanence increases, effectiveness drops like a rock."

Until the leaching limitation is overcome, borate-treated lumber will remain a smart choice for locations not directly exposed to the weather or in homes where mold allergies are an issue.

Best uses: Sill plates; exterior-wall framing; zone framing in mold-prone locations like sheds, outbuildings, and basements

The Good

- Not harmful to humans, pets, or the environment.
- Can be disposed of like untreated lumber and even can be burned.
- Has no corrosive effect on metal fasteners or hardware.
- Can be applied to dimensional as well as engineered lumber.

The Bad

- Preservative readily leaches out of wood in wet conditions.
- Can't be used in ground contact or in areas with high exposure to the elements.
- Some manufacturers suggest that cut ends be coated with a borate solution, which slows construction time.

Cost

FrameGuard
2-in. by 4-in. by 9-ft. stud: \$3
BluWood
2-in. by 4-in. by 10-ft. board: \$5.50
BluWood
4-in. by 8-in. by ¾-in. plywood: \$22

Sources

BluWood
www.perfectbarrier.com
FrameGuard
www.wolmanizedwood.com
Hi-bor and Advance Guard
www.osmose.com



TimberSIL claims to revolutionize wood preservation, but lacks hard data.

New compounds and organic treatments are on the way

The future of wood preservatives most likely belongs to an emerging class of carbon-based compounds.

Chemical Specialties Inc. (CSI), for example, is expected to begin production of an organically treated lumber called Ecolife. According to CSI, the wood will be less corrosive to metal fasteners than wood treated with copper-based

preservatives. Ecolife's intended use is outdoors—as decking material, for example—but not for ground contact. However, the company says it expects to have ground-contact preservatives on the market soon.

Developing an effective organic treatment that can be used outside and especially in contact with the ground is no easy task. There are many eco-

nomical and technical roadblocks in the way. Lengthy government and code reviews are just one of the many inhibiting factors.

Dr. Darrell Nicholas, a professor and researcher at the College of Forest Resources at Mississippi State University, points to a compound called PXTS as a good example of the pitfalls in the approval

FRPL Fiberglass-reinforced plastic lumber

Plastic lumber is extremely durable and environmentally friendly

Made with high-density polyethylene and fiberglass, this material is available in dimensions from 5/4-in. deck boards to 12x12 posts and even as sheathing designed to replace plywood.

Plastic lumber doesn't absorb water, so it won't crack or rot over time. It does not leach; it resists insect and mold damage; and it resists degradation from oil, fuel, and fungi. Used milk jugs, recycled detergent bottles, and the like make up the plastic component of the lumber, so it's also a green building material. Sound perfect? It might be for high-stress marine and commercial environments where even conventional pressure-treated lumber isn't tough enough.

However, plastic lumber has three major drawbacks: cost, weight, and flexibility. Two or three times as expensive as treated wood, plastic lumber weighs a lot: A 10-ft.-long 2x4 can weigh more than 20 lb. This material is also susceptible to "creep," a tendency to sag under a load over time. As a result, structural plastics are limited to shorter span distances than equally sized dimensional lumber. Residential use of the material is not yet listed by the International Residential Code (IRC), so it might be limited to housing projects that carry an engineer's stamp; check with local building officials for approval.

Best uses: Outdoor and marine projects like sheds, playgrounds, decks, docks, and retaining walls

The Good

- Resists decay in even the most severe environments.
- Nontoxic and nonleaching.
- Requires little maintenance once in place.

The Bad

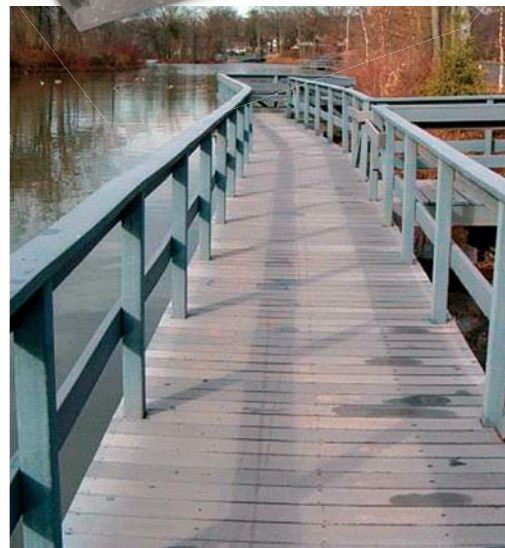
- Load-bearing capacity is less than dimensional lumber of the same size.
- It's heavy, expensive, and currently not recognized by the IRC.

Cost

FiberForce 2-in. by 4-in. by 9-ft. stud: \$27
4-ft. by 8-ft. by 1/2-in. plywood: \$113

Sources

American Composite Timbers
www.compositetimbers.com
FiberForce
www.plasticboards.com
Trimax Structural Lumber
www.trimaxbp.com



process. PXTS, an organic sulfur treatment developed by Akzo Nobel, looked promising after years of testing. It showed virtually no toxicity to humans, and it was effective in protecting wood. The company got the compound approved for industrial use, Nicholas says, but efforts to win residential approval were shelved, at least in part

because the approval process took so long.

Nicholas says that chemical companies are working vigorously to produce new organic treatments, and he expects several to be available in the next few years.

A company called Timber Treatment Technologies (TTT) is taking another approach with a product called Timber-

SIL. Relying on a proprietary combination of sodium silicate and heat, TimberSIL is supposed to be noncorrosive to fasteners, nonleaching, nontoxic, and fire-resistant, and it also is suitable for ground contact.

Distribution, however, is limited, and the company has become entangled in a legal dispute with its original

treater. Also, TTT has not publicized independent performance data verifying the claims that have been made about TimberSIL.

Although it has won new-product awards from *Popular Science* and *Metropolitan Home* magazines and the *GreenSpec Directory*, there are still a lot of questions to be answered about TimberSIL.