Do we need the A in the CCA?

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Introduction

Copper-chromium-arsenic (CCA) is the most widely used wood preservative in the world. Treatment plants using this preservative were first installed in Australia in the late 1950's, and since then, use has increased to about 8000 tonnes per year to produce some 800,000 m^3 treated product. However, there are growing concerns about the use of CCA, resulting in restriction of use in neighbouring countries such as Indonesia and Japan, and current vigorous debate in the USA. Much of the concern is unfounded, as a number of studies have shown that CCA treated timber is safe to use with a few sensible precautions (Greaves 1997). Most attention focuses on arsenic, because the common inorganic forms are carcinogens and toxic to mammals. However, it should be noted that the arsenic (V) used in wood preservation is less toxic than trivalent arsenic, and once fixed in wood has further reacted into complex and immobilised forms. CCA plant guidelines (AS 2843.1: 2000) have addressed contamination risks from the treatment plant. However, disposal of CCA treated timber remains a problem. Accidental or misinformed disposal by fire can liberate arsine gas. Consequently, CCA-treated timber does not lend itself to simple industrial incineration due to arsenic content. The copper and chromium components collect predominantly in the ash.

This paper examines the need for arsenic, by comparing CCA with copper chromate (CC, but also often called acid copper chromate or ACC) and CCB (where boron leaches so is effectively copper chromate). Originally, arsenic was thought to be needed for insect control. However, the latest theory is that arsenic is more useful in controlling copper tolerant brown rotting fungi. CCA alternatives that lack chromium and arsenic are available in Australia (ACQ and Tanalith E). However, they are more expensive than CCA and have not yet gained widespread market share. Environmentally, they have the advantage over CC in also lacking chromium.

Discussion

Laboratory decay trials such as by Da Costa (1967) have shown that CC treated pine can be severely decayed by certain brown rot fungi. In comparison, the arsenic in CCA reduces brown rot. The same studies show that white rots are sensitive to CC. Morrell (1991) reviewed the impact of copper tolerant brown rot fungi and observed that the high degree of copper tolerance does not often translate into the field. In-ground decay trials of CC in Australia support this observation. Johnson and Thornton (1991a) described the 25 year inspection of a major preservative trial where CC in *P. radiata* performed as well as CCA (Tanalith C and Celcure A) in Sydney, and almost as well in Walpeup. In *Eucalyptus regnans* sapwood, CC was better than CCA at Sydney, and intermediate between the two CCAs at Walpeup. Furthermore, *P. radiata* stakes inspected at the PNG sites after 15.6 years (Tamblyn and Levy 1981) showed that CC and CCB were similar in performance to Tanalith C and Tanalith CA (high arsenic CCA), while Celcure A performed better than all. *P.*

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radiata stake tests in NZ (Hedley et al. 2000) showed CCB performing better than CCA after 20 years at three sites, but significantly worse at two sites where good soil drainage favoured brown rots. These preservatives were compared on a similar total active elements (TAE) basis, where the boron component of CCB had probably leached rapidly to leave a lower retention of 'CC'. Walters (1970) conducted a six-year trial of treated *P. radiata* in cooling towers, which provides a severe soft rot hazard (H5). He found that 'Acid copper chromate and CCB were as effective as the CCA preservatives'.

These results for decay suggest that CC is as effective as CCA when compared on a similar TAE basis, except in soils favouring brown rot. This qualifier may only apply to softwoods, which are predisposed to brown rot. Johnson and Thornton (1991b) showed that hardwoods are much more vulnerable to soft and white rot than brown rot, and these are the fungi that can be controlled with CC.

We have not compared these preservatives in the laboratory against termites. Nevertheless, after 30 years at Walpeup, CC treated *P. sylvestris* stakes performed similarly to CCA against termites (mean ratings 7.3 and 7.4 respectively on a scale of 8-0 where 8 is sound), although CC had suffered slightly more brown rot (mean ratings 5.0 and 6.3 respectively, Thornton and Johnson unpubl). Kalnins and Erickson (1986) recommend CC in beehives as effective and safer than CCA.

One of the most severe exposure conditions for wood is marine exposure (H6), where the main hazard is from marine borers, and some soft rot activity. After 25 years in the sea at Sydney and Kwinana (near Perth), CC treated *P. radiata* and *E. macrorhyncha* specimens were as good or better than Tanalith C and Celcure A when treated to 27 kg/m^3 formulation retentions (Barnacle and Cookson 1995). In a 17 year old trial in Sydney Harbour, *P. sylvestris* and *Alstonia scholaris* treated with CCA or CCB performed similarly (unpublished data), even though boron had leached.

In summary, the use of copper chromate in Australia is supported by several long-term trials. Research should determine which soils favour brown rots, as these could limit use in softwoods. More information against decay fungi in the above-ground (H3) hazard is also desirable.

References

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