Evaluation of the comparative performance of Alkaline Copper Quat and Micronized Copper Quat formulations in field stake tests.

By

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INTRODUCTION

Alkaline Copper Quat (ACQ) is currently one of the major wood preservatives used for wood products in the U.S. and other countries. The ACQ preservative uses an amine to complex, and thus solubilize, copper in order to form a water soluble treating solution. ACQ has been used as a wood preservative for over 20 years and has a stellar performance record. Recently, a modified version of ACQ was introduced into the market place. This preservative has the acronym MCQ and does not contain an amine. Aqueous formulations of this preservative are obtained by fine grinding the Cu in the presence of stabilizers to form micro- and/or nano- particles which can be suspended in water. The quat component of MCQ is the same as that used for ACQ.

MCQ was introduced into the market place during the last 2 years with very limited test data, which is of concern to a number of wood scientists because the Cu component has limited ability to penetrate the wood cell wall and does not chemically react with the wood. Furthermore, the size of the Cu particles is fairly close to the intercellular openings in wood and this might possibly affect the uniform distribution of Cu throughout the wood structure. Because of these concerns about the performance of MCQ, Viance scientists have established some lab and field trials to compare the performance of MCQ to that of ACQ. Details of the field trials are presented below. My role in this project is to provide an independent evaluation of the experimental procedures used and also provide an independent inspection of the field stakes.

EXPERIMENTAL

The treated wood used in this study was obtained by Viance employees from commercial building materials dealers in Charlotte, NC on February 26, 2007. The material selected consisted of 4 x 4 posts treated to a specified retention of 0.4 pcf. A total of seven posts treated with ACQ were purchased from Lowe's and seven posts treated with MCQ were purchased from Home Depot, both from stores in the Charlotte, NC area. Full details of chain of custody were provided in regards to these materials.

Before cutting test stakes, each post was crosscut into four foot lengths and then thin cross sectional wafers were cut from each of the posts. One set of these wafers were then sprayed with a heartwood indicator and also a Cu penetration indicator in order to elucidate the preservative penetration patterns, which were quite uniform. The treated portion—excluding the untreated heartwood areas—of another set of wafers was analyzed for the preservative components (CuO and DDACarbonate). Following this, field stakes measuring 30 x 30 x 450mm were cut from corner section of each of the posts, with care being taken to avoid untreated heartwood areas. A total of 60 stakes were cut from both the ACQ and MCQ treated posts. In addition, 120 stakes were cut from untreated southern yellow pine boards to serve as controls.

Ten stakes from each treatment along with 10 untreated control stakes were installed in the Hilo, Hawaii test site on April 11, 2007. Following this, 20 stakes from each treatment along with untreated controls were installed in the Tanegashima, Japan test site in early May 2007. I inspected and rated the Tanegashima test stakes on February 20, 2008 and the Hilo test stakes on February 27, 2008. The field stake tests at both test sites are established and maintained in accordance with the norms of the AWPA E7 test procedure for field stake tests.

In addition to the above stake tests, Viance scientists have initiated a fungus cellar decay test and a Formosan termite field stake test with this test material.

RESULTS AND DISCUSSION

The results from my inspection of the field stakes installed in Japan are presented in Table 1. From this data it is apparent that this is an aggressive test site, with many of the untreated controls and MCQ treated wood stakes showing considerable decay after approximately nine months' exposure. It is also apparent from this data that the ACQ treated stakes are performing very well, with none of the stakes showing evidence of decay.

TABLE 1. DECAY RATINGS FOR FIELD STAKES TREATED WITH ACQ AND MCQ AFTER NINE MONTHS EXPOSURE IN TANEGASHIMA, JAPAN.

ACQ			MCQ			UNTREATED		
Stake No.	**Retn. (pcf) [1]**	**Rating[2]**	**Stake No.**	**Retn. (pcf) [1]**	**Rating[2]**	**Stake No.**	**Retn. (pcf) [1]**	**Rating[2]**
83858	0.46	10	83878	0.40	9	83979	0	8
83859	0.46	10	83879	0.40	10	83980	0	0
83860	0.46	10	83880	0.40	10	83981	0	0
83861	0.53	10	83881	0.41.	10	83982	0	0
83862	0.53	10	83882	0.41	10	83983	0	7
83863	0.53	10	83883	0.41	8	83984	0	0
83864	0.44	10	83884	0.43	4	83985	0	10
83865	0.44	10	83885	0.43	10	83986	0	9
83866	0.44	10	83886	0.43	10	83987	0	0
83867	0.52	10	83887	0.36	6	83988	0	8
83868	0.52	10	83888	0.36	9	83989	0	0
83869	0.52	10	83889	0.36	9	83990	0	8
83870	0.44	10	83890	0.41	4	83991	0	10
83871	0.44	10	83891	0.41	10	83992	0	4
83872	0.44	10	83892	0.41	10	83993	0	0
83873	0.51	10	83893	0.46	10	83994	0	0
83874	0.51	10	83894	0.46	7	83995	0	0
83875	0.51	10	83895	0.46	4	83996	0	9
83876	0.39.	10	83896	0.32	0	83997	0	7
83877	0.39	10	83897	0.32	7			
Mean		10.0			7.85			4.21

[1] Average preservative retention for cross sectional treated area for the post that the stakes were cut from.
[2] Stakes were rated in accordance with AWPA Standard E 7 with 10 denoting sound and 0 denoting failure.

Inspection results for the stakes exposed at the Hilo test site are presented in Table 2. From this data it is apparent that most of the control samples are showing evidence of decay, indicating that the test site has a high level of decay potential. For the MCQ treated samples, two stakes have minor amounts of decay and another two show evidence of suspected decay. In contrast the ACQ treated stakes are all sound.

TABLE 2. DECAY RATINGS FOR FIELD STAKES TREATED WITH ACQ AND MCQ AFTER TEN MONTHS EXPOSURE IN HILO, HAWAII

ACQ			MCQ			UNTREATED		
Stake No.	**Retn. (pcf)[1]**	**Rating[2]**	**Stake No.**	**Retn. (pcf)[1]**	**Rating[2]**	**Stake No.**	**Retn. (pcf)[1]**	**Rating[2]**
83899	0.46	10	83919	0.40	10	83999	0	9
83901	0.53	10	83921	0.41	9	84001	0	9
83903	0.53	10	83923	0.41	9.5	84003	0	6
83905	0.44	10	83925	0.43	10	84005	0	8
83907	0.52	10	83927	0.36	10	84007	0	10
83909	0.52	10	83929	0.36	10	84009	0	6
83911	0.44	10	83931	0.41	10	84011	0	6
83913	0.51	10	83933	0.46	9.5	84013	0	8
83915	0.51	10	83935	0.46	10	84015	0	10
83917	0.39	10	83937	0.32	9	84017	0	9

[1] Average preservative retention for cross sectional treated area for the post that the stakes were cut from.
[2]Stakes were rated in accordance with AWPA Standard E7 with 10 denoting sound and O denoting failure.

The analytical data for the posts indicates that the posts were treated in accordance with AWPA standards. There is some variation in preservative retentions of the different posts, but this is normal for commercial treatments. Furthermore, there does not appear to be any correlation between retention levels and performance of the individual stakes.

It is apparent from the results obtained at these two test sites that MCQ is performing poorly, even though the analytical data indicates that the test material was treated in accordance the 0.4pcf ground contact retention specified for ACQ within the AWPA standards.

CONCLUSIONS

On the basis of these field tests it is apparent that the MCQ formulation is not performing in ground contact as would be expected for a commercial wood preservative. The presence of wood decay in the MCQ treated samples after a very short exposure period suggests that this formulation has been compromised by the use of particulate copper rather than soluble amine-complexed copper. Additional field stake test data will be required to confirm this concern about the performance of MCQ in ground contact applications. Consequently, it is recommended that the field stakes be closely monitored in the future.

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