

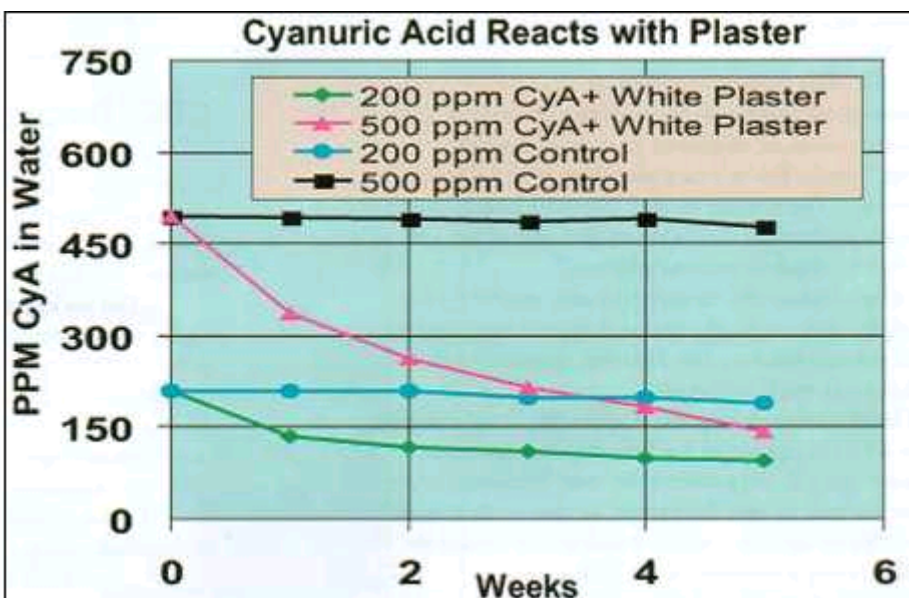


High Cyanuric Acid Levels & Plaster Degradation In Swimming Pools

by Ellen M. Meyer, *Ph.D*

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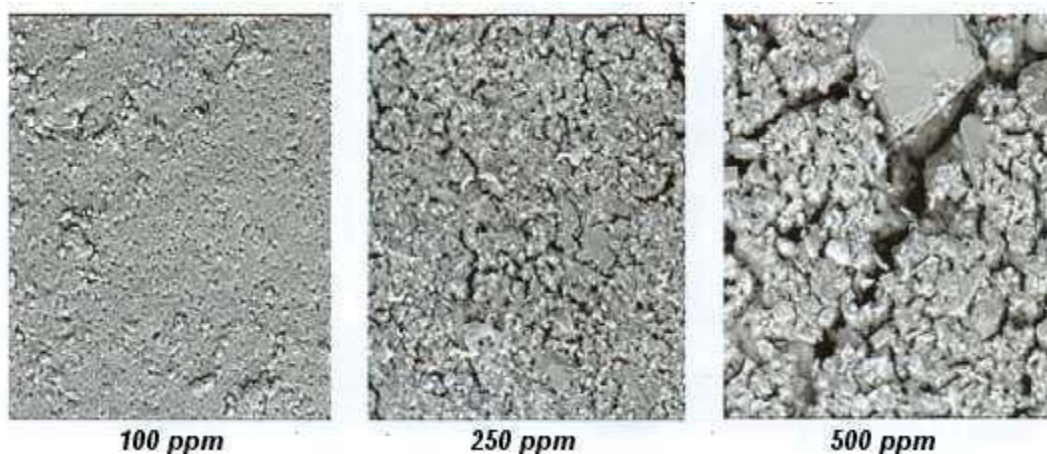
It is well known that the build-up of cyanuric acid stabilizer in swimming pool water will cause overstabilization, which usually results from the extended use of stabilized sanitizers in conjunction with stabilized shock treatments.



It is also known that overstabilization decreases the effectiveness of chlorine in killing bacteria and algae and will reduce the oxidation reduction potential or the oxidizing power of chlorine.

Low levels of cyanuric acid do serve a purpose in protecting chlorine from sunlight degradation, however, too much cyanuric acid will negate any benefit and cause problems. When used properly, the recommended level of cyanuric acid is between 20 and 50 parts per million (ppm). Cyanuric acid use is not recommended for indoor pools.

To determine the effect of cyanuric acid on sections of white pool plaster, Arch Chemicals conducted laboratory studies in 2004. The levels of cyanuric acid tested were 200 ppm and 500 ppm. After five weeks, the cyanuric acid in the water with the plaster 'coupons' - which are individual rectangles of plaster made using the same plaster composition that is used for pools - had dropped considerably and surface analysis showed the accumulation of cyanuric acid on the plaster. Surface reaction was observed at 250 ppm and 500 ppm, with the reaction of cyanuric acid being much faster in the 500 ppm sample, as shown in the graph entitled 'Cyanuric Acid Reacts with Plaster'.



Based on these initial results, a six month tank test was conducted to better understand the effect of cyanuric acid on plaster. The water in the tank tests was adjusted to try and maintain pH between 7.2 and 7.8 and alkalinity between 60 ppm to 100 ppm. Because the plaster coupons were new, the pH rose continuously and therefore needed to be adjusted daily. The free available chlorine was maintained between 1 ppm and 4 ppm and cyanuric acid levels of 0 ppm, 25 ppm, 50 ppm, 100 ppm, 250 ppm, and 500 ppm were tested. Images taken with a scanning electron microscope at a magnification level of 250X show degradation of the plaster surface at increasing levels of cyanuric acid (see photo at bottom of page).

There was little plaster degradation at 100 ppm cyanuric acid. Due to the results of the tank tests, additional tests were initiated in larger bodies of water where the water balance parameters could be maintained more easily.

Pool testing with plaster coupons was started in May, 2005, with the pools being operated at cyanuric acid levels of 0 ppm - 50 ppm - 110 ppm - 125 ppm, and 200 ppm - 250 ppm. The water parameters were maintained at a pH of 7.2 - 7.6, alkalinity at 80 ppm - 120 ppm, calcium hardness at 180 ppm - 250 ppm, and available chlorine at 1 ppm - 4 ppm.

After four months of operation, photographs show surface degradation on the plaster coupons in high, 200 ppm - 250 ppm cyanuric acid pools (see photos above).

Results reported in a July, 2004 study conducted by the National Pool Industry Research Center (NPIRC) and the National Plasterer's Council (NPC) indicate that low pH trichlor products can affect plaster surfaces. However, in the NPIRC study, it was difficult to discern whether the effect on the plaster was a result of the low pH or the trichlor sanitizer, or from some other chemical factor.

In the tank studies described above, the pH and alkalinity of the tanks ran on the high side (pH~8, TA~90 ppm), while the pool were being maintained as indicated above. Despite the high pH and alkalinity in the tank test, plaster degradation was still seen. The pool tests further confirmed the effect of cyanuric acid on plaster.

These results indicate that the presence of cyanuric acid can affect plaster surfaces and that a minimum amount should be used only if chlorine stabilization is necessary.



Left: 14X magnification of plaster coupon in pool with 0 ppm cyanuric acid.

Right: 14X magnification of plaster coupon in pool with 200-250 ppm cyanuric acid.

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