

## Comparison of Spartan Series® for Monochloramine Reduction in Water

### INTRODUCTION

Spartan series® was compared with two other activated carbons for their ability to reduce monochloramine levels in a water solution. Spartan series® is a non-chemically impregnated coconut based activated carbon that has been surface modified during manufacture. This surface modification significantly enhances its ability for rapid decomposition of chloramines and hydrogen sulfide. The other two activated carbons evaluated were a standard coconut based and a well known competitive surface modified product. The carbon samples were pulverized, contacted with a 4.2 or 4.1 ppm monochloramine solution in water and reduction in monochloramine was monitored over time. The activated carbons that decomposed the monochloramine faster, exhibited greater surface modification.

### PROCEDURE

Throughout the test a temperature of 21° C was maintained. A stock monochloramine solution was prepared by mixing 250 ml of a solution containing ammonium chloride (0.375 g) in distilled water with 250 ml of a solution containing sodium carbonate (0.313 g) and Clorox bleach (3.0 ml of 6%) in distilled water. A working monochloramine solution was prepared by diluting 10.0 ml of the stock solution with 1 liter of distilled water containing sodium carbonate (0.100 g). The pH of this working solution was >8 ensuring the chloramines present would be monochloramine. This working solution was made at least 1 hour before use.

Monochloramine was measured using a Hach pocket colorimeter II. To a 5 ml water sample, 2 Hach reagent pillows for total chlorine were added. The sample was gently shaken for 20 seconds then after 3 minutes, the total chlorine was analyzed in the colorimeter. To a second 5 ml water sample, 2 Hach reagent pillows for free chlorine were added. The sample was gently shaken for 20 seconds then within 1 minute, the free chlorine was analyzed in the colorimeter. Since excess ammonium chloride was used in preparation of the water solution, this ensured no free chlorine was present. Therefore, the amount of total chlorine detected represented the amount of monochloramine present. The working solutions had a monochloramine concentration of 4.2 and 4.1 ppm.

An amount of 400 ml of the working solution was added to a beaker. The solution was stirred constantly on a magnetic stirrer sufficient for a ½ inch vortex. An amount of 0.200 g of the pulverized carbon sample was added to the stirred solution. 10 ml aliquots were withdrawn from the carbon/water suspension after 1, 2, 3, 5, and 10 minutes of carbon contact. After each aliquot was withdrawn, it was immediately filtered through a 0.45 micron filter to remove all the pulverized activated carbon from the treated water. The filtrates were then analyzed for monochloramine.



## Results and Discussion

The monochloramine results are presented in the below table and attached graph. All monochloramine concentrations are reported as ppm. The initial monochloramine concentration before carbon addition was recorded at 0 minutes.

| ID                     | 0 min. | 1 min. | 2 min. | 3 min. | 5 min. | 10 min. |
|------------------------|--------|--------|--------|--------|--------|---------|
| <b>Spartan series®</b> | 4.2    | 3.1    | 2.7    | 2.4    | 2.1    | 1.6     |
| Competitive Product    | 4.1    | 3.8    | 3.6    | 3.4    | 3.2    | 2.9     |
| Standard Coconut Based | 4.1    | 4.0    | 4.0    | 3.9    | 3.8    | 3.6     |

**Spartan series®** exhibited the best monochloramine removal performance. After two minutes carbon contact **Spartan series®** removed 36% of the monochloramine, “Competitive Product” 12% and standard coconut based carbon 2.4%. Therefore, **Spartan series®** was 3 times more effective than the Competitive Product, and 15 times more effective than standard coconut based carbon.

The superior performance of **Spartan series®** to decompose monochloramine much more effectively than either standard coconut carbon, or a “Competitive Product”, demonstrates the degree to which its surface modification has markedly enhanced its performance.

## CONCLUSIONS

- **Spartan series®** was superior for monochloramine reduction in water compared to competitive surface modified activated carbon.
- **Spartan series®** was superior for monochloramine reduction in water compared to standard coconut based activated carbon.

REMOVAL OF MONOCHLORAMINE

