



ENVIROTEK LABORATORIES, INC.

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EPA ID # NJ01298 NJ DEP ID # 08012

MCHM REDUCTION TEST REPORT

Report # 14-16-MCHM Reduction Test (Adya Clarity Mineral Solution)
Customer Name: Adya, Inc.
Report Date: March 5, 2014

EXECUTIVE SUMMARY

Three liters of tap water were spiked with 400 µg of 4-Methyl-1-cyclohexanemethanol (MCHM) in a flask, 12 mL of Adya Clarity was added to this solution, the flask was closed and mixed well; one liter of this solution was filter through 0.45 micron paper after 12 hours, a second liter of this solution was filtered through 0.45 micron paper after 24 hours, the final liter of the solution was filtered through 0.45 micron paper after 48 hours. A control was prepared under the same conditions without adding Adya Clarity to the water. The spiked solution and the filtered solutions were tested following the EPA method 525 for drinking water; the MCHM in the tap water was reduced by 99.9% after 48 hours of adding Adya Clarity to the spiked solution and filtered through 0.45 micron filter paper.

INTRODUCTION

Three liters of tap water were spiked with 400 µg of 4-Methyl-1-cyclohexanemethanol (MCHM) in a flask, 12 mL of Adya Clarity was added to this solution, the flask was closed and mixed well; one liter of this solution was filter through 0.45 micron paper after 12 hours, a second liter of this solution was filtered through 0.45 micron paper after 24 hours, the final liter of the solution was filtered through 0.45 micron paper after 48 hours. A control was prepared under the same conditions without adding Adya Clarity to the water. The initial spiked solution and the filtered solutions were tested following the EPA method 525 for drinking water; the MCHM in the tap water was reduced by 99.9% after 48 hours of adding Adya Clarity to the spiked solution and filtered through 0.45 micron filter paper.

REAGENTS AND LAB EQUIPMENT

Adya Clarity mineral solution.
4-Methyl-1-cyclohexanemethanol (MCHM) TCI America, Product Code M1412, CAS # 34885-03-5, Reagent grade >98.0%.
Hewlet Packard 5890/5972 GC/MS with Chem Station data system.
Micro syringes and type A glassware necessary to perform the EPA 525 method for drinking water analysis.
Hach 0.45 microns filter paper.

PROCEDURE

Three liters of tap water were spiked with 400 µg of 4-Methyl-1-cyclohexanemethanol (MCHM) in a flask. Added 12 mL of Adya Clarity to the spiked solution, the flask was closed, mixed well and let sit for 12, 24, and 48 hours inside a fume hood. One liter of the solution was filtered through a 0.45 micron paper after 12 hours, a second liter of the solution was filtered through a 0.45 micron paper after 24 hours, the final liter of the solution was filtered through a 0.45 micron paper after 48 hours, the initial spiked solution and the filtered solutions were tested following the EPA method 525 for drinking water. A control was prepared under the same conditions without adding Adya Clarity to the water. The results are summarized in Tables 1 and 2 below.

RESULTS

Table 1
Spiked Tap Water Properties

Parameter	Spiked Tap Water	Target
pH	7.25	7.00 to 8.00
TDS	295 mg/L	200 to 500 mg/L
Temperature	19.5 °C	20 ± 2.5°C
Turbidity	0.45 NTU	< 1 Nephelometric Turbidity Units
Free Chlorine	0.5 mg/L	0.25 to 2.0 mg/L
MCHM	135 µg/L	135 µg/L



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Table 2
Filtered Water Results

Time Before Filtering	MCHM concentration in Adya Clarity Filtered Water	% Reduction in Adya Clarity Filtered Water	MCHM concentration in Filtered Water (control)	% Reduction in Filtered Water (control)
12 hours.	7.5 µg/L	94.4 %	12.8 µg/L	90.5 %
24 hours	3.5 µg/L	97.4 %	5.9 µg/L	95.6%
48 hours	<0.1 µg/L	99.9 %	1.1 µg/L	99.2 %

The MCHM creates a milky foam in the water, it also reacts with the free chlorine in the water to form by-products that were not identify at this time. The control sample shows an amount of by-products and a milky foam after filtration, the solution treated with the Adya Clarity shows less amount of by-products and a lighter foam after filtration.

Figure 1
MCHM Standard Gas Chromatogram.

```
File       : C:\HPCHEM\1\DATA\022114MC\04.D
Operator  :
Acquired   : 21 Feb 2014  11:54 am using AcqMethod MCHM.M
Instrument : GC/MS Ins
Sample Name : Std 2.5 ppb
Misc Info  :
Vial Number : 4
```

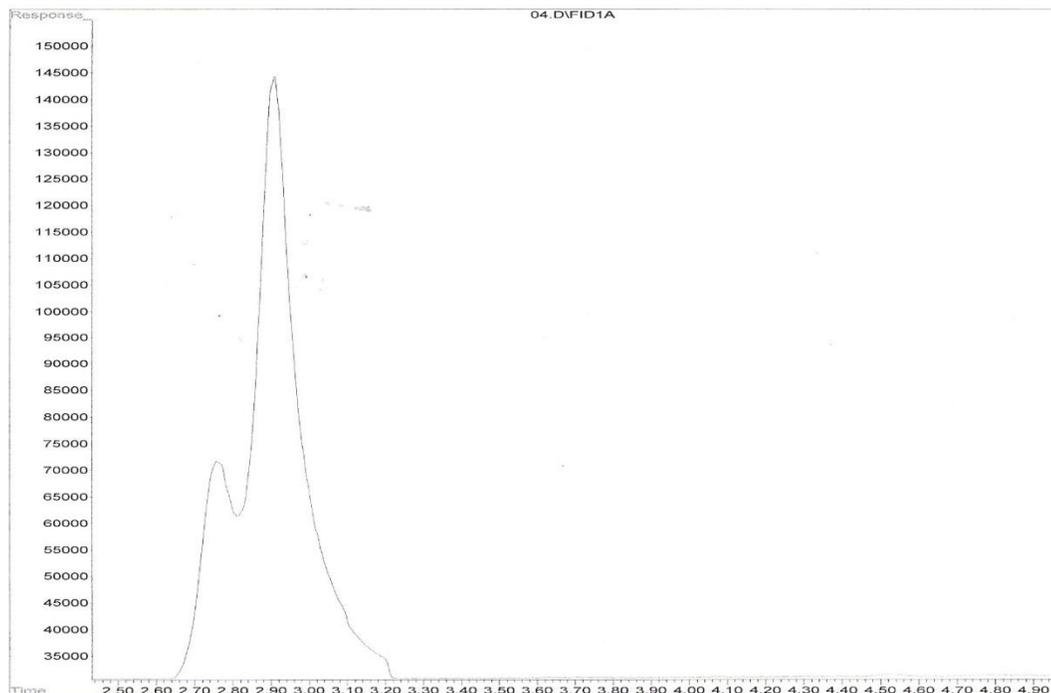


Figure1: Gas Chromatogram of the 4-Methyl-1-Cyclohexanemethanol (cis and trans mixture) TCI America, Product Code M1412, CAS # 34885-03-5, Reagent grade >98.0%. The standard was prepared in methylene chloride at a concentration of 2.5 ppb, the chromatogram shows a coelution of the cis and the trans compounds at a retention time of 2.70 to 3.20 minutes. No peaks were observed after 3.20 minutes in this chromatogram.



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Figure 2.
MCHM Control Filtered Water Gas Chromatogram.

File : C:\HPCHEM\1\DATA\030414MC\06.D
Operator :
Acquired : 4 Mar 2014 11:30 pm using AcqMethod MCHM.M
Instrument : GC/MS Ins
Sample Name: MCHM filter
Misc Info :
Vial Number: 6

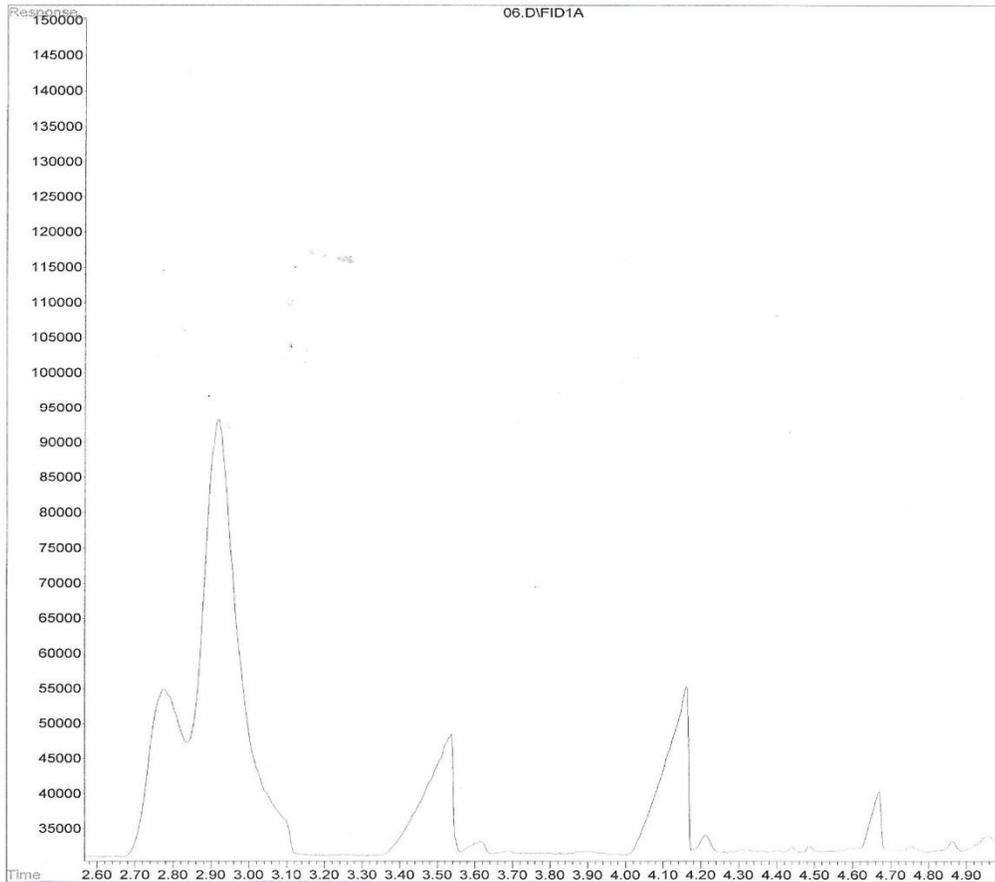


Figure 2: Gas Chromatogram of the MCHM challenge water solution prepared with tap water, the free chlorine in the tap water reacts with the MCHM to produce by-products that were not identify at this time. The concentration of the MCHM detected in the water after filtration was 1.1 ppb.



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Figure 3.
MCHM Adya Clarity Treated Filtered Water Gas Chromatogram.

```
File       : C:\HPCHEM\1\DATA\022114MC\09.D
Operator  :
Acquired  : 21 Feb 2014   1:05 pm using AcqMethod MCHM.M
Instrument : GC/MS Ins
Sample Name : 14-16-1 MCHM 48
Misc Info  :
Vial Number : 9
```

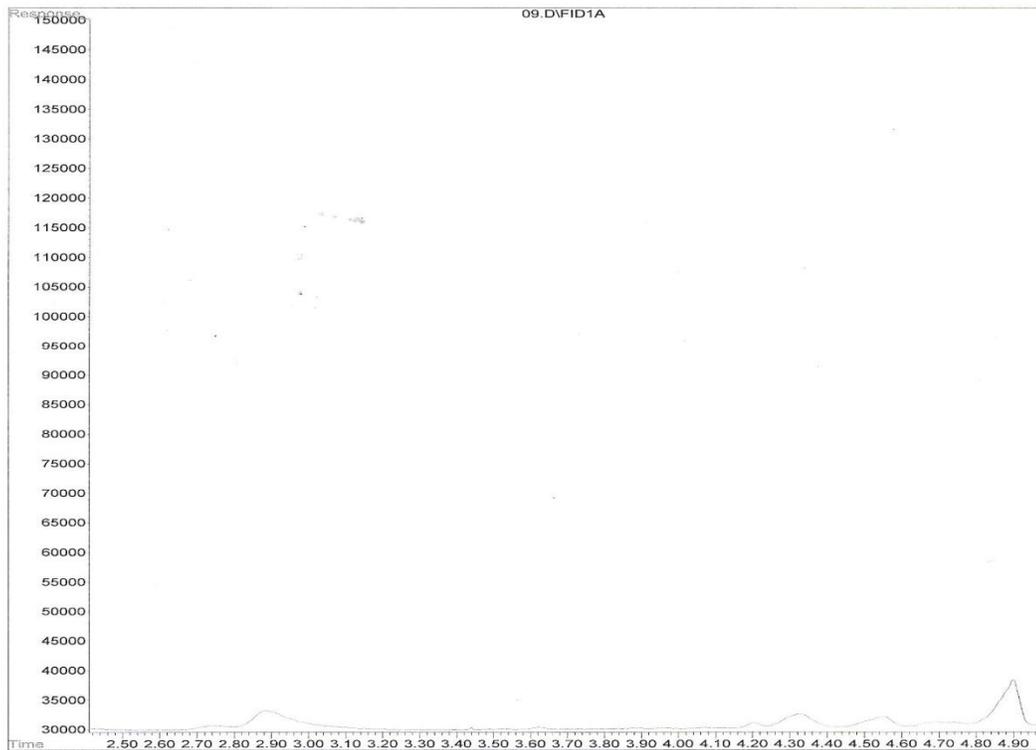


Figure 3: Gas Chromatogram of the MCHM Adya Clarity treated filtered water solution prepared with tap water, the free chlorine by-products detected are in much lower concentrations than those detected in the untreated challenge filtered water. The concentration of the MCHM detected in the Adya Clarity treated water after filtration was less than 0.1 ppb.

CONCLUSION

The Adya Clarity mineral solution combined with the 0.45 microns filter paper reduced the MCHM concentration in the tap water by 99.9 % after 48 hours treatment. The challenge water must be filtered through a filter paper of 0.45 microns or better filter to reduce the MCHM concentration in the water.

Jaime A. Young

Jaime A. Young
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