

TCLP TEST DATA FOR MRM[®] ORGANOCCLAY

Organoclay MRM[™] sorbent media was developed as a means of removing all forms of mercury from wastewater and groundwater. Organoclay MRM[™] adsorbs mercury through chemically bonding the contaminated species to the media's internal and external surfaces. When all of the adsorption sites are saturated with contaminants, the media is said to be "spent". A test program was developed to determine if the spent mercury loaded media could pass a Toxicity Characteristic Leaching Procedure (TCLP) test.

Analytical Procedures

The study was broken into two parts. The first portion focused on the generation of the spent mercury media and the second portion focused on conducting the TCLP test for mercury.

A 1/20 ratio of fresh Organoclay MRM[™] to a solution of known mercury (II) concentration was mixed in a glass container. This mixture was tumbled for 72 hours, filtered under vacuum, and the filtrate was analyzed by Inductively Coupled Plasma (ICP) for its mercury concentration. The filtered solid, Organoclay MRM[™] media with sorbed mercury, was conserved for the second portion of the study.

Once the spent media was generated, a 1/20 ratio of spent media to distilled water with 0.6% acetic acid was mixed in a glass container. A standard volume for the distilled water is 2-liter. Test 1 was run under the full scale TCLP test conditions, while Tests 2 and 3 were 1/20th scale of the standard TCLP test. In the study when a small volume of water is used, the 1/20 ratio was retained. This mixture was tumbled for 18 hours, and then filtered under vacuum. The filtrate was analyzed by ICP for its mercury concentration.

Results Summary

Table 1: Generation of Spent Media

	Test 1	Test 2	Test 3
Hg soln. conc., Initial (ppm)	25	50	100
Hg soln. volume (mL)	2000	50	50
pH prior to mixing	2.74	1.47	1.29
Media weight (g)	100.0	2.5	2.5
Mixing time (hours)	72	72	72
Total Hg in the mix (g)	0.05	0.0025	0.005
pH after mixing	2.89	2.67	2.50
Hg conc. After mixing (ppm)	ND	0.044	0.092
Hg removal (%)	100.0	99.9	99.9
Hg loading on spent material (%)	0.05	0.10	0.20

ND = Non-detectable. The detection limit = 0.02 ppm

Table 2: TCLP of Organoclay MRM Spent Media

	Test 1	Test 2	Test 3
DI soln. volume (mL)	2000	50	50
pH prior to mixing	3.03	2.94	2.90
Spent media weight (g)	100.0	2.5	2.5
Mixing time (hours)	18	18	18
pH after mixing	3.26	2.92	2.85
Hg conc. After mixing (ppm)	ND	ND	0.02
Pass/Fail TCLP test ¹	Pass	Pass	Pass

1. [Hg] should be < 0.2 ppm in order to pass TCLP test.

Discussions and Conclusions

The first part of this study, which focused on the generation of spent Organoclay MRM™ media, showed that 72 hours was sufficient time for the media to remove ~100% of the mercury from the solutions in Tests 1-3. Test 1 consisted of 2000 mL of 25 ppm Hg solution and 100 g of Organoclay MRM™. In the 72 hours that the solution and media mixed, the pH of the solution rose from 2.74 to 2.89 and the media adsorbed 100% of the mercury from solution. Tests 2 and 3 mixed only 2.5 g of MRM in 50 mL of 50 ppm and 100 ppm mercury solutions, respectively, but still followed the 1/20 ratio used in Test 1. The pH of the solution in Test 2 rose from 1.47 to 2.67, and the pH of the solution in Test 3 rose from 1.29 to 2.50. In both tests 2 and 3, the media adsorbed 99.9% of the mercury in solution.

In order to pass the TCLP test, the resulting leachate had to contain less than 0.2 ppm mercury. All three tests showed that the spent media was able to pass the TCLP. In Tests 1 and 2, the leachate mercury concentration was under the instrument detection limit of 0.02 ppm. In Test 3, which utilized media that was used in the adsorption of 100 ppm mercury, the leachate had a concentration of 0.02 ppm which also passed the TCLP test.

The results indicate that Organoclay MRM™ media, after adsorbing 0.2% by weight mercury (II), has the ability to pass a mercury TCLP test.