ORGANOCLAY COMPATIBILITY WITH BIOPOLYMER AND BREAKER SOLUTIONS

Introduction

One of the more common construction techniques for permeable reactive barrier (PRB) projects is excavation and simultaneous filling of the trench with biodegradable slurry. The biopolymer slurry supports the trench excavation until the reactive material is placed through the slurry by tremie pipe. Recirculation wells are spaced along the length of the trench. Residual slurry in the PRB is broken down by circulation of an acid and/or enzymatic breaker fluid allowing groundwater to flow through the PRB.

It is critical during PRB design to examine the compatibility of proposed treatment chemicals and reactive materials. The purpose of this study is to investigate the compatibility of CETCO's PM-199 organoclay media and (Rantec Corporation's) biopolymer-breaker systems. The study involved tests on the quaternary amine content determination and oil adsorption capacity of the organoclay.

Sample History, Preparation and Tests

CETCO provided a PM-199 organoclay sample (Lot # OB-040106-1) to Rantec Corporation (Ranchester, WY). The following treatment procedures were conducted in Rantec's lab. The organoclay was first suspended in a biopolymer solution. The biopolymer was Rantec G150, a guar gum based polymer with the concentration of 80 lb/1000 Gallon. Then the organoclay suspension was brought to pH of 9 and subsequently aged for 24-hrs. There were two suspensions prepared under the same conditions described above. One suspension was adjusted to pH < 7 with an HCl solution and then broken with the enzyme breaker of LEB-4; the other broken with the enzyme breaker of LEB-H with no pH adjustment. The organoclay particles settled after the breaker treatment.

These two samples, each stored in 1-gallon plastic jar, were sent back to the CETCO lab for further study.

A portion of each was taken and filtered using gravity filtration technique with Whatman #1 filter paper (11µm), and the filtered solid was collected and oven dried at 85 ^{o}C overnight.

Two characterization tests were conducted on each of the two dried solids. A thermogravimetric analysis (TGA) was performed to determine the amine content. The adsorption under no load (AUNL) test was also performed in order to determine the organoclay's oil adsorption capacity. The AUNL test allows completion of the test using a small quantity of sample and collection of the results in a short period of time, which is different from the typical test we run on oil adsorption capacity study for QA/QC.

A control PM-199 organoclay sample with the same lot number was also located and tested as produced for comparison purposes.

Observations, Results and Discussions

The samples arrived in clear plastic containers. The organoclay particles were already settled on the

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bottom of jar and appeared in their usual granular geometry. There was no sign that the organoclay was swelling through the polymer treatment process. During the filtration, it was noticed a slight white film formed on the filtered solid surface. The film was possible, formed from the finer particles generated through the wetting-suspending-breaking process. Nevertheless, it did not affect gravity filtration.

After drying, the organoclay sample appeared like the control sample in color and geometry. The dried organoclays were used for both tests and their results were summarized in **Table 1**.

Table 1. TGA and AUNL Test Results

Organoclay Samples	Dry Ash by TGA %	Amine Content by TGA %	Oil Adsorption Capacity by AUNL g/g
LEB-4	66.58	29.91	0.524
LEB-H	66.55	29.95	0.543
Control	65.24	31.33	0.565

The results showed that the organoclay amine content decreased 4.5% after the suspending-breaking process followed by the lab separation-drying procedure. The TGA tests did not indicate that any significant amount of biopolymer-breaker was coated on the organoclay surface during the processes. An approximate 4-7% decrease in the oil adsorption capacity was also observed for the samples that underwent polymer treatment. The changes could be attributed to such factors as test method errors and sample homogeneity.

Conclusions

The biopolymer and breaker treatments tested had an insignificant impact on PM-199 amine content and oil adsorption capacity. Based upon this testing PM-199 organoclay is compatible with Rantec G-150 biopolymer and LEB-4 and LEB-H breaker systems and they can be used together in PRB installations.

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