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memorandum

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EARTH AND ENVIRONMENTAL SCIENCES DIVISION

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Symbol:
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Subject: Drilling Fluid Characterization

Methods

Samples of Quikfoam and the supernatant of EZMud were analyzed using Gas Chromatography Mass spectrometry (GCMS). Pure samples of Quikfoam and EZmud were gravimetrically diluted with reagent-grade Methanol to final concentrations of 10,232ppm Quikfoam and 8220ppm EZMud for direct injection analysis.

Analyses were performed with an Agilent 6890N GC equipped with a CTC Analytics autosampler coupled to an Agilent 5975 inert source MSD. For direct injection, 0.1microlitre of sample was injected into a 175°C injection port in 500:1 and 200:1 split modes.). Analytes were separated on a J&W Scientific DB-Waxetr GC column (30m, 0.32mm, 0.5micrometer film thickness). The column was programmed from 50°C (12 minute hold time) to 225°C (30 minute hold time) at a 20°C/min. Ultrahigh purity helium was sued as a carrier gas at a an average velocity of 49cm/sec.

Quikfoam GCMS results

Ethanol (Et-OH), Isopropy Alcohol (IPA), and water are the predominant components of Quikfoam (Figure 1). Comparison of peak heights measured for Et-OH and IPA from Quikfoam to known standards results in concentration estimates of: 4.5% IPA and 7.5% Et-OH, by weight. These abundances fall in line with reported abundances for these analytes listed on the MSDS sheet.

Internal standards for other analytes were not used. Therefore, to estimate the abundance of analytes such as 1-Octanol, the relative intensity of 1-Octanol was compared to relative intensities of IPA and Et-OH (which were calibrated), and a concentration for 1-Octanol was estimated.. The most significant potential error in this style of 'calibration' is that it assumes that 1-Octanol and IPA, or Et-OH have similar response factors in the GCMS. Relative Peak intensities are listed in Table 1.

Table 1

Analyte	peak area	ret. Time	Calc. conc.	conc. Relative to IPA	conc. Relative to Et-OH
IPA	29411914	6.781	4.47%		
Et-OH	67796138	6.851	7.52%		
1-Octanol	2107560	16.063		2300ppm	3200ppm

The concentrations listed in Table 1 for 1-octanol may be used to estimate concentrations for analytes illustrated in Figure 2, which is a GCMS chromatogram for Quikfoam loaded at a lesser

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dilution factor (250:1 rather than 500:1). A 'solvent delay' was used to exclude Et-OH and IPA, which would have saturated the detector.

Table 2.

Retention Time	Compound	CAS#	Qualifier
17.67	1-Octanol	000111-87-5	91
19.012	1-Heptanol, 4-methyl-	000817-91-4	43
19.414	Sulfurous acid, butyl pentyl ester	1000309-17-1	38
20.554	Octane, 2,4,6-trimethyl-	062016-37-9	47
21.537	Sulfurous acid, butyl pentyl ester	1000309-17-1	38
23.091	Oxirane, 2-methyl-3-propyl-, cis-	006124-90-9	43
25.221	Pentaethylene glycol	004792-15-8	42
29.038	Pentaethylene glycol	004792-15-8	47

Compounds listed in Table 2 are the 'best fit' for mass spectra collected for each significant peak illustrated in Figure. 2. With the exception of 1-Octanol, which has a qualifier of 91, all of the spectra matching is at low qualification (i.e. less than 50). This is likely due to the fact that upon injection into the GCMS interface, the compounds fragment into a variety of smaller compounds, which are not 'naturally occuring', or compounds typically found in the GSMS library database.

Spectra used to uniquely identify compounds are included with the rest of the figures in increasing order of retention time.