EMSL Analytical, Inc.

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Materials Science Division

Attn.: *Gerald Brent*
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EMSL Case No.: 360600014-USSEC
Sample(s) Received: 1/6/06
Date of Analysis: 1/20/06/Rev1/31/06
Date Printed: 4/11/06
Reported By: E. Mirica

- Laboratory Report -

-Revised Report-

Concentration of Organic Nitrogen, Potash (K_2CO_3), and Orthophosphate

Material Identification

Analyzed by: *Eugenia Mirica, Ph.D.*
Materials Scientist
January 31, 2006
Date

QA/QC : *John Newton*
Laboratory Manager
January 31, 2006
Date

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Conclusions:

- The material in the sample consists predominantly of elemental carbon. Organic nitrogen, potash, and phosphorus-based compounds are also present. Approximately 5% of the material is composed of various other components which could not be determined; it is suspected that they are the most stable forms of carbonates and oxides.

Procurement of Samples and Analytical Overview:

The sample for analysis (bulk) arrived at EMSL Analytical's corporate laboratory in Westmont, NJ on January 6, 2006. The package arrived in satisfactory condition with no evidence of damage to the contents. The sample was submitted for the purpose of determining the concentration of organic nitrogen, potash (K_2CO_3), and phosphorus as orthophosphate. A further request was made to determine all components of the sample. The sample reported herein has been analyzed using the following equipment and methodologies.

Methods & Equipment:

X-ray Fluorescence Spectrometry (XRF) [Standardless Analysis method with Bruker S4 spectrometer and Bruker AXS Spectra^{plus} software version 1.6.1]

Polarized Light Microscopy (PLM)
epi-Reflected Light Microscopy (RLM)
Scanning Electron Microscopy (SEM)
Energy-dispersive X-Ray Spectrometry (EDX)
Attenuated Total Reflection – Fourier Transform Infrared Spectrometry (ATR-FTIR)

EPA 351.3 – Nitrogen, Organic
EPA 9056 – Orthophosphate as P

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Results and Discussion:

Table 1: The concentration of organic nitrogen, potash, and orthophosphate in the sample.

Sample Identification	Analyte	Concentration (wt %)	LOD (wt %)
Soy Ash	Nitrogen, Total Organic	7.125	0.00125
	Potash (K_2CO_3) (see Note 1)	6.53	0.0021 (for K)
	Phosphorus, orthophosphate	0.039	0.000001

Limit of Detection (LOD): The minimum concentration that can be theoretically achieved for a given analytical procedure in the absence of matrix or sample processing effects. Particle analysis is limited to a single occurrence of an analyte particle in the sub-sample analyzed.

Note 1: Potash was calculated from the concentration of potassium (K) determined by XRF analysis (see Table 2).

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Table 2: Elemental composition of the material from the sample as determined by XRF analysis.

Sample Identification	Elements	Concentration (wt %)
Soy Ash	Carbon (C)	86.73
	Nitrogen (N) (see Note 2)	7.2
	Potassium (K)	3.69
	Phosphorus (P)	0.922
	Calcium (Ca)	0.509
	Magnesium (Mg)	0.476
	Aluminum (Al)	0.18
	Sulfur (S)	0.109
	Iron (Fe)	0.084
	Silicon (Si)	0.045
	Chlorine (Cl)	0.016
	Titanium (Ti)	0.012
	Zinc (Zn)	0.0099
	Copper (Cu)	0.0071
	Manganese (Mn)	0.0069
	Strontium (Sr)	0.0031

Note 2: Nitrogen cannot be analyzed with the XRF instrument used in this analysis. Therefore, the total nitrogen concentration as derived by EPA method 351.3 was used in the matrix description to derive the concentration of other elements found in the sample.

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Table 3. The components in the sample, as determined by compilation of results listed in tables 2 and 3 (rounded to nearest 1%).

Sample Identification	Components	Concentration (%)
Soy Ash	Elemental carbon	80
	Nitrogen-containing compounds	7
	Potash	7
	Phosphorus- containing compounds	1
	Other components	5

LOD: ~1%