



EMSL Analytical, Inc.

107 Haddon Avenue, Westmont, NJ 08108
Phone: (856) 858-4800

Attn.: *Walt Hendrix*
Progress Energy
200 CPL Drive
Arden, NC 28704

Phone: 828-687-5247 Fax: 828-687

EMSL Case No.: 360900115
Sample(s) Received: 1/23/09
Date of Analysis: 1/27/09
Date Printed: 1/28/09
Reported By: E. Mirica

Materials Science Division

- Laboratory Report -
-Preliminary report-

Material Identification

For

Project: Cenosphere

Analyzed by:

Eugenia Mirica, Ph.D.
Senior Materials Scientist

January 28, 2009

Date

QA/QC :

John Newton
Laboratory Manager

January 28, 2009

Date



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Procurement of Samples and Analytical Overview:

The samples for analysis (bulk) arrived at EMSL Analytical's corporate laboratory in Westmont, NJ on January 23, 2009. The package arrived in satisfactory condition with no evidence of damage to the contents. The samples were submitted for the purpose of determining the individual components. The samples reported herein have been analyzed using the following equipment and methodologies.

Methods & Equipment:

Light Stereomicroscope (LM)
epi-Reflected Light Microscopy (RLM)
Polarized Light Microscopy (PLM)
Scanning Electron Microscopy (SEM)
Energy-dispersive X-Ray Spectrometry (EDX)
X-Ray Diffraction (XRD)
X-ray Fluorescence (XRF)
Thermogravimetry (TGA)



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Results and Discussion:

Table 1: The components of sample "Off site sample A" as determined by compilation of all the methods used in the analysis.

Sample Identification	Components	Concentration (%)	LOQ (%)
Off site sample A	Cenospheres/Fly ash	94	1
	Quartz	3	1
	Carbon (total)	2	1
	Unidentified	<1	1

The concentration of total carbon was determined by thermogravimetry (weight loss upon heating).

Cenospheres are lightweight, inert, hollow sphere filled with inert air or gas, typically produced as a byproduct of coal combustion at thermal power plants. They have a ceramic composition with SiO₂ and Al₂O₃ as the main components.



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Table 2. Elemental composition expressed as elements (measured) and oxides (by stoichiometric calculation) for sample "Off site sample A".

Element	Conc. (wt%)	A		LOD (wt%)
		Oxide	Conc. (wt%)	
Si	23.6	SiO ₂	50.5	0.0027
Al	15.7	Al ₂ O ₃	29.6	0.0080
K	4.70	CaO	5.66	0.0053
Fe	3.70	K ₂ O	5.30	0.0023
Ca	1.16	CaO	1.63	0.0039
S	0.783	SO ₂	1.96	0.0031
Mg	0.769	MgO	1.27	0.014
Ti	0.717	TiO ₂	1.20	0.0030
Na	0.285	Na ₂ O	0.385	0.011
Ba	0.139	BaO	0.155	0.0099
Sr	0.0456	SrO	0.0539	0.0012
P	0.0395	P ₂ O ₅	0.906	0.0033
Zr	0.0289	ZrO ₂	0.0390	0.0014
Rb	0.0281	Rb ₂ O	0.0307	0.0033
Mn	0.0204	MnO	0.0264	0.0011
Cr	0.0170	Cr ₂ O ₃	0.0249	0.0026
As	0.0070	As ₂ O ₃	0.0078	0.000078
Y	0.0139	Y ₂ O ₃	0.0176	0.0085
Zn	0.0082	ZnO	0.0102	0.0014
Ga	0.0028	Ga ₂ O ₃	0.00371	0.0014
C+O	Balance	C	Balance	N/A

The concentration of Cr in the table is total chromium present in the sample. The concentration of Cr+6 is shown in Table 4.



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Table 3. The concentrations of crystalline silica (quartz, tridymite and cristobalite) in sample "Off site sample A".

Sample Identification	Quartz	Cristobalite	Tridymite	Quartz	Cristobalite	Tridymite
	Concentration (%)	Concentration (%)	Concentration (%)	LOD	LOD	LOD
Off site sample A	3.2	<LOD	<LOD	0.6	2.5	2.5

Table 4. The concentration of Cr+6 in sample "Off site sample A"-

Sample Identification	Analyte	Concentration	LOQ (wt%)
Off site sample A	Cr+6	<LOQ	0.00048



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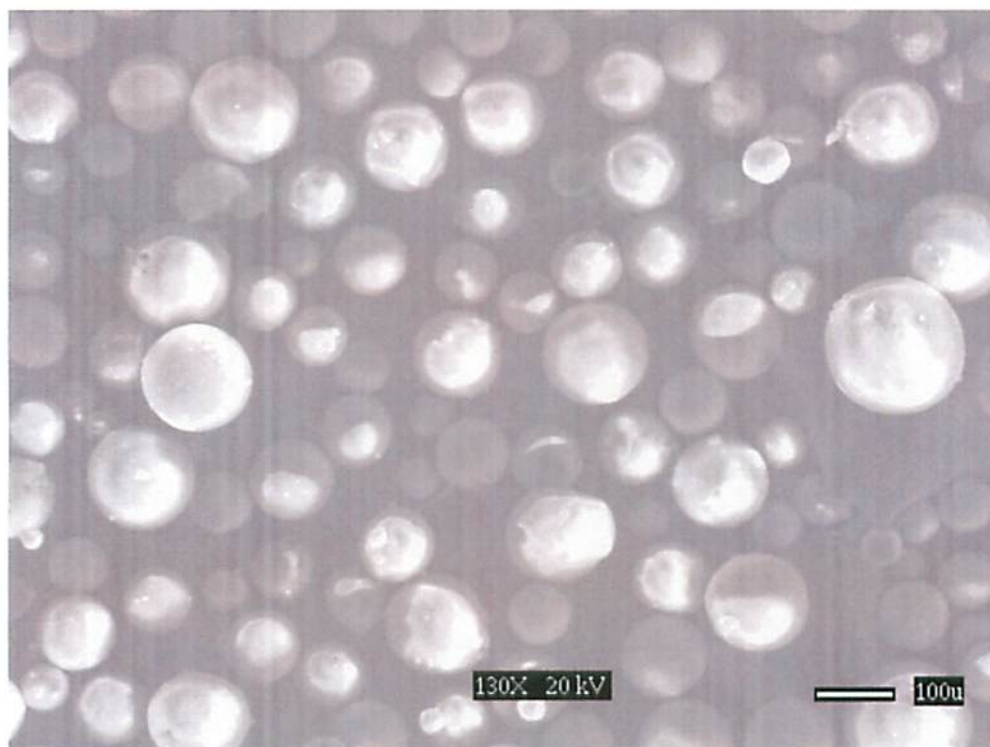


Figure 1. SEM image of the cenopheres found in sample "Off site sample A".



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Descriptions & Definitions:

None Detected (ND) denotes the absence of an analyte in the subsample analyzed. Trace levels of the analyte may be present in the sample below the limit of detection (LOD).

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.

Limit of Quantitation (LOQ): The minimum concentration of an analyte that can be measured within specified limits of precision and accuracy during routine laboratory operating conditions

Concentrations for bulk samples are derived from Visual Area Estimation (VAE) unless otherwise noted. Air sample concentrations are calculated to particles per unit volume.

VAE technique estimates the relative projected area of a certain type of particulate from a mixture of particulate by comparison to data derived from analysis of calibration materials having similar texture and particulate content. Due to bi-dimensional nature of the measurements, in some cases the particle thickness could affect the results.

The results are obtained using the methods and sampling procedures as described in the report or as stated in the published standard methods, and are only guaranteed to the accuracy and precision consistent with the used methods and sampling procedures. Any change in methods and sampling procedure may generate substantially different results. EMSL Analytical, Inc. assumes no responsibility or liability for the manner in which the results are used or interpreted. Legally defensible reports require hand signatures. Reports with digital signatures are for email and other digital distribution only.

