

## INSPECTION REPORT

In pursuance of an order for inspection given to us,

**BY** : **URALCHEM TRADING SIA**  
**TO INSPECT** : **SHUNGITE IN BULK**  
**AT** : **TOLVUJA, RUSSIA**  
**ON** : **MAY 15, 2015**  
**BY** : **VISUAL INSPECTION, SAMPLING AND ANALYSIS**

**THIS IS TO REPORT** that we performed visual inspection, sampling and analysis of shungite in bulk.

### STORAGE:

Cargo was stored in stockpiles on the berth.

### SAMPLING:

Sampling MATERIAL IN MOTION, on systematic known MASS intervals basis. SGS Principal was duly informed that Manual Sampling method was used, as sampling by other methods was not possible. Manual sampling was performed under protocols stipulated in ISO Standards. Increments were collected from freshly exposed surface, on a mass interval basis, with fixed increment mass. Method of Sampling as per ISO 18283 5.3.

### ANALYSIS:

Samples were analysed according to ISO and ASTM Methods. The following are the results of analysis performed at the SGS laboratory in St.Petersburg, Russia, sample No. 1423.

Parameters	Assay's method used	as received basis	dry basis	dry ash-free basis
moisture, %	(ISO 589)	1.80	-	-
ash, %	(ISO 1171)	64.50	65.68	-
volatile matter, %	(ISO 562)	2.08	2.12	6.18
total sulphur, %	(ASTM 4239)	0.77	0.78	2.28
gross cal value (kcal/kg)	(ISO 1928:2009)	2406	2450	7139
net cal value (kcal/kg)	(ISO 1928:2009)	2359	-	-

Ash fusion temperatures (ASTM D 1857):	Reducing atm. Deg. C	Oxidizing atm. Deg. C
Initial deformation	>1500	>1500
Softening point	>1500	>1500
Hemispherical point	>1500	>1500
Fluid point	>1500	>1500

Ultimate Analysis (ISO 29541)	As received basis	Dry basis
Total carbon, %	31.83	32.41
Hydrogen (in coal), %	0.75	0.77
Nitrogen, %	0.35	0.35

HGI Result (ASTM D 409)	24
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Elemental Ash Analysis %	Dry Basis	Method
SiO <sub>2</sub>	89.00	ASTM D 6349
Al <sub>2</sub> O <sub>3</sub>	5.11	ASTM D 6349
Fe <sub>2</sub> O <sub>3</sub>	3.27	ASTM D 6349
CaO	0.16	ASTM D 6349
MgO	1.03	ASTM D 6349
Na <sub>2</sub> O	0.11	ASTM D 3682
K <sub>2</sub> O	0.75	ASTM D 3682
TiO <sub>2</sub>	0.30	ASTM D 6349
SO <sub>3</sub>	0.15	ASTM D 5016
P <sub>2</sub> O <sub>5</sub>	0.09	ASTM D 6349
MnO <sub>2</sub>	0.01	ASTM D 3683

Trace Elements ASTM D 6357/3684/4606	ppm
Arsenic (As)	29
Manganese (Mn)	58.0
Chromium (Cr)	320
Vanadium (V)	190
Nickel (Ni)	290
Zinc (Zn)	92
Lead (Pb)	5.2
Antimony (Sb)	<1.0
Cadmium (Cd)	0.80
Cobalt (Co)	10.5
Copper (Cu)	100
Tin (Sn)	0.28
Mercury (Hg)	1.1
Selenium (Se)	3.9

Beryllium (Be), mg/kg	<1.0
Molybdenum (Mo), mg/kg	10
Boron (B), mg/kg	8.0

**SCREEN TEST:** The size distribution was determined as follows:

+50 mm	33.0 %
31.5 - 50 mm	36.3 %
10 - 31.5 mm	28.9 %
06 - 10 mm	0.8 %
0 - 06 mm	1.0 %

Sieve test was performed using square holed sieves.

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SIGNED AND DATED AT  
ST.PETERSBURG  
MAY 25, 2015

FOR AND ON BEHALF OF  
SGS VOSTOK LIMITED

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