



Job File No.: 181202/65647-0003/M-NK-2015

**ANALYTICAL REPORT**

In pursuance of an order for inspection given to us

**BY** : " CARBO ONE LIMITED "  
**TO ANALYZE** : Coal Sample 0-50 mm, grade "HV Low CV", (as declared)  
**AT** : SGS Laboratory

**WE HEREBY REPORT** that we have performed analysis of the sample delivered to us by our Principal on 05.01.2015. The sample, weighting 17,000 kg, was packed in polypropylene bag, with a label of producer's inspection department and not sealed.

**I. ANALYSES WERE PERFORMED IN SGS LABORATORY:**

1. **Proximate analysis** was performed in SGS laboratory (Accreditation Certificate No. POCC U.0001.21TY38, valid till 22.09.2016) according to ISO Methods with results as follows:

Basis reported	Total moisture, % ISO 589-2003, ISO 5068-1- 2007	Ash, % ISO 1171-97	Yield of volatile matter, % ISO 562-98	Total sulphur, % ISO 19579-92	Gross calorific value, kcal/kg ISO 1928-76
As Received	14.3	7.3	32.4	0.49	5922
Dry Basis		8.6	37.9	0.57	6909
Dry Ash Free			41.4	0.63	7556
Moist ash free					6476

Net Calorific Value (as received) was calculated in accordance with ISO 1928:2009 (Pt. 12.2.2.1 и Pt E.3.3): 5643 kcal/kg

2. **Determination of characteristics of hygroscopic moisture** was performed in accordance with GOST 8719-90 with results as follows:

Hygroscopic moisture: 7.56 %

**SGS Vostok Limited**

312-24, Ordzhonikidze Street, 654005 Novokuznetsk

**Russian Federation**

t : +7 3843 39 16 81, 39 16 82, 39 16 83 f : +7 3843 39 12 42

e: ru.novokuznetsk@sgs.com

www.ru.sgs.com

Member of SGS Group

This document is issued by the Company subject to its General Conditions of Service ([www.sgs.com/en/Terms-and-Conditions.aspx](http://www.sgs.com/en/Terms-and-Conditions.aspx)). Attention is drawn to the limitations of liability, indemnification and jurisdictional issues established therein.

This document is to be treated as an original within the meaning of UCP 600. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.



3. Determination of characteristics of plastic layer was performed in accordance with GOST 1186-87:

Attribute	Unit	Value
X	mm	44
Y	mm	0

4. Ultimate analysis was performed in accordance with GOST methods with results as follows:

Element	Percentage, %
	Dry Ash Free basis
Carbon	78.77
Hydrogen	5.50
Nitrogen	2.01
Oxygen	13.09

5. Determination of chemical composition of ash was performed in accordance with ISO methods with results as follows:

Compounds	Percentage, %
Silicon dioxide	59.93
Alumina	25.46
Iron trioxide	4.82
Titanium dioxide	0.96
Calcium oxide	3.77
Magnesium oxide	1.30
Potassium oxide	1.94
Sodium oxide	0.23
Sulphur trioxide	0.71
Phosphorus oxide	0.680
Manganese oxide	0.198



**6. Determination of elements' content** was performed in accordance with ISO methods with results as follows:

Compounds	Percentage, %
Fluorine	0.0083
Chlorine	0.0075
Arsenic	0.001
Phosphorous	0.025
Sodium	0.015
Potassium	0.138

\*All values are reported on dry basis.

**7. Determination of Roga Index** was performed in accordance with ISO 335-74 with results as follows:

**RI 0 (1:5)**

**8. Determination of plasticity according to Gieseler** was performed in accordance with ASTM D 2639-98:

Attribute	Unit	Value
Initial softening Temperature	°C	-
Max. Fluidity Temperature	°C	-
Resolidification Temperature	°C	-
Max. fluidity	ddpm	0

**9. Audiber Arnu Dilatometer test** was determined in accordance with ISO 349-75:

Attribute	Unit	Value
Softening Temperature	°C	435.3
Max. Contraction Temperature	°C	510.4
Max. Dilatation Temperature	°C	-
Contraction	%	1.6
Dilatation	%	



**10. Determination of Hardgrove Index** was performed in accordance with ASTM D 409-93 with results as follows:

**HGI 44**

**11. Determination of ash fusibility** was performed in accordance with ASTM D1857-87 with results as follows:

Attribute	Unit	Value/atmosphere	
		Oxidizing	Reducing
Initial deformation temperature	0C	1526	1467
Softening temperature	0C	1543	1486
Hemispherical temperature	0C	1556	1500
Fluid temperature	0C	> 1550	1538

## II. ANALYSES WERE PERFORMED IN SUBCONTRACTED LABORATORY:

The sample was sent to subcontracted laboratory OAO "Zapadno-Sibirski Ispytatelny Centr" (Accreditation Certificate No. POCC RU.0001.21 AЯ 07.) for analysis, and the findings reported by OAO "Zapadno-Sibirski Ispytatelny Centr" were as follows:

**1. Determination of elements' content** was performed in accordance with ISO methods with results as follows:

Compounds	Percentage, %
Germanium	< 0.0001
Selenium	0.12*10 <sup>-4</sup>
Gallium	0.0003
Mercury	< 0.02*10 <sup>-4</sup>

### SGS Vostok Limited

312-24, Ordzhonikidze Street, 654005 Novokuznetsk

Russian Federation

t : +7 3843 39 16 81, 39 16 82, 39 16 83 f : +7 3843 39 12 42

e: ru.novokuznetsk@sgs.com

www.ru.sgs.com

Member of SGS Group

This document is issued by the Company subject to its General Conditions of Service ([www.sgs.com/en/Terms-and-Conditions.aspx](http://www.sgs.com/en/Terms-and-Conditions.aspx)). Attention is drawn to the limitations of liability, indemnification and jurisdictional issues established therein.

This document is to be treated as an original within the meaning of UCP 600. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.



2. Values of sulphur forms were determined with the following results:

Attribute	Test Method, Standard	Result
Total sulphur, Sd . %	GOST 8606-93	0.53
Pyrite sulphur, Sd . %	GOST 30404-00	0.15
Sulphate sulphur, Sd . %	GOST 30404-00	0.003

4. Determination of elements' spectral content was performed in accordance with ISO methods with results as follows:

Element	Content, %	Element	Content, %	Element	Content, %
Ba	0.05	Cd	< 0.001	Pb	< 0.0002
Be	0.0002	Co	< 0.0001	Ag	< 0.00001
B	0.004	Li	< 0.001	Sc	0.0002
Bi	< 0.0002	La	< 0.002	Sr	0.02
V	0.001	Mn	0.004	Sb	< 0.002
W	< 0.002	Cu	0.0005	Ti	0.1
Yb	0.0002	Mo	0.0004	P	< 0.1
Y	0.005	As	< 0.01	Cr	0.001
Nb	0.002	Ni	0.001	Ce	< 0.02
Sn	< 0.0002	Zr	0.02	Zn	0.003

5. Determination of grindability by VTI methods was performed in accordance with GOST 15489.1-93:

VTI 1.46

**SGS Vostok Limited**

312-24, Ordzhonikidze Street, 654005 Novokuznetsk

**Russian Federation**

t : +7 3843 39 16 81, 39 16 82, 39 16 83 f : +7 3843 39 12 42

e: ru.novokuznetsk@sgs.com

www.ru.sgs.com

Member of SGS Group

This document is issued by the Company subject to its General Conditions of Service ([www.sgs.com/en/Terms-and-Conditions.aspx](http://www.sgs.com/en/Terms-and-Conditions.aspx)). Attention is drawn to the limitations of liability, indemnification and jurisdictional issues established therein.

This document is to be treated as an original within the meaning of UCP 600. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.



6. Determination of petrographic composition and metamorphism stage was performed in accordance with ISO 7404 and the reported results are as follows:

Composition		Percentage,
Coal		91.0
Mineral inclusions	Clay	9.0
	Quartz	sporadic
	Sulphide	sporadic
	Carbonate	sporadic

**Microlythotype:**

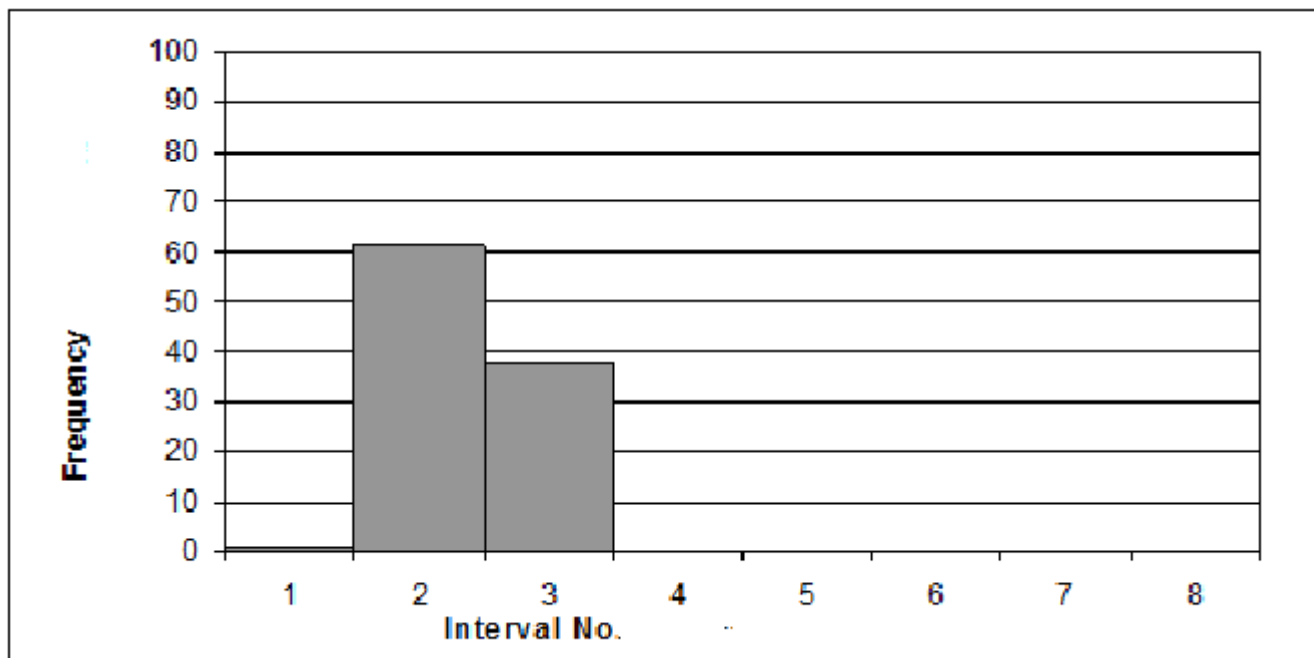
Microconstituent	Percentage, %
Vitrinite	72.0
Semivitrinite	sporadic
Inertinite	22.0
Liptinite	6.0

**Sum of the fusainized components**

**ΣOK 22.0 %**

**Rank O<sub>3</sub>**

Interval No.	Ro min	Ro max	Frequency, %
1	0.00	0.39	1
2	0.40	0.49	61
3	0.50	0.64	38
4	0.65	0.74	-
5	0.75	0.84	-
6	0.85	1.99	-
7	1.00	1.14	-
8	1.15	1.29	-



**Reflectance indices R<sub>0</sub>:**

Average	0.488
Minimum	0.38
Maximum	0.57
Standard deviation	0.036
Quantity of scissions	0

**WARNING:** The sample(s) to which the findings recorded herein (the "Findings") relate was (were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted.

This document is a witness of services in collection and processing of information rendering.

Signed and dated  
in Novokuznetsk / ES  
20 January 2015



For and on behalf of  
SGS Vostok Limited

**SGS Vostok Limited**

312-24, Ordzhonikidze Street, 654005 Novokuznetsk

**Russian Federation**

t : +7 3843 39 16 81, 39 16 82, 39 16 83 f : +7 3843 39 12 42

e: ru.novokuznetsk@sgs.com

www.ru.sgs.com

Member of SGS Group

This document is issued by the Company subject to its General Conditions of Service ([www.sgs.com/en/Terms-and-Conditions.aspx](http://www.sgs.com/en/Terms-and-Conditions.aspx)). Attention is drawn to the limitations of liability, indemnification and jurisdictional issues established therein.

This document is to be treated as an original within the meaning of UCP 600. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.