



CERTIFICATE OF ANALYSIS

Page 1 of 5

Order #
1484

Order Status
Order Fulfilled

Report #
1484-11592-ICPF

Date of Report
5th April 2021

Report for: Bernard Carey, Biomass to Biochar Ltd, Derrycon Upper, Mountshannon, Co. Clare, Ireland

Sample Name - Oaten Straw

Thermal Analysis - Summary Data

Test	Method Reference	Units	As-Received	Dry Mass Basis	Dry Ash-Free Basis
Moisture	EN 14774-1:2009	%	33.68	-	-
Total Solids	Calculated	%	66.32	-	-
Ash	EN 14775:2009	%	4.65	7.00	-
Volatile Solids	Calculated	%	61.67	93.00	-
Carbon	EN 15104:2011	%	30.55	46.06	49.53
Hydrogen	EN 15104:2011	%	3.66	5.51	5.93
Nitrogen	EN 15104:2011	%	0.41	0.61	0.66
Sulphur	EN 15289:2011	%	0.03	0.05	0.06
Chlorine	EN 15289:2011	%	0.5929	0.8941	0.9615
Oxygen	By Difference	%	27.03	40.75	43.82
Volatile Matter	EN 15148:2009	%	48.73	73.49	79.02
Fixed Carbon	By Difference	%	12.94	19.51	20.98
Gross Calorific Value	EN 14918:2009	MJ/kg	12.7672	19.2522	20.7023
Net Calorific Value	EN 14918:2009	MJ/kg	11.1465	18.0493	19.4088

- Data at www.celignis.com/output/analytical_customer_view.php?editid1=28518
- Data converted to different bases according to EN 15296:2011.

Lab Manager Signature:

CELIGNIS LIMITED

Unit 11 Holland Road, Plassey
Tech. Park, Limerick, Ireland

**ALL WORK IS UNDERTAKEN SUBJECT
TO OUR TERMS AND CONDITIONS**

www.celignis.com

info@celignis.com

T: (353) 61 371 725

This report shall not be reproduced except in full without written approval of Celignis Limited

Order #	Order Status	Report #	Date of Report
1484	Order Fulfilled	1484-11592-ICPF	5th April 2021

Report for: Bernard Carey, Biomass to Biochar Ltd, Derrycon Upper, Mountshannon, Co. Clare, Ireland

Sample Name - Oaten Straw

Proximate Analysis - Replicate Data

Dry Matter Basis (% Dry Mass)

Test	Method Reference	Units	Average	Replicate 1	Replicate 2	Standard Deviation
Volatile Solids	EN 14775:2009	%	93.00	92.96	93.03	0.05
Ash	EN 14775:2009	%	7.00	7.04	6.97	0.05
Volatile Matter	EN 15148:2009	%	73.49	73.58	73.39	0.14
Fixed Carbon	By Difference	%	19.51	19.41	19.60	0.14

As-Received Basis (% Wet Mass)

Test	Method Reference	Units	Average	Replicate 1	Replicate 2	Standard Deviation
Moisture Content	EN 14774-1:2009	% wb	33.68	32.97	34.40	1.01
Total Solids	Calculated	% wb	66.32	67.03	65.60	1.01
Volatile Solids	Calculated	% wb	61.68	61.65	61.70	0.04
Ash	Calculated	% wb	4.64	4.67	4.62	0.04
Volatile Matter	Calculated	% wb	48.73	48.80	48.67	0.09
Fixed Carbon	Calculated	% wb	12.94	12.87	13.00	0.09

Dry Ash-Free Basis (% DAF Mass)

Test	Method Reference	Units	Average	Replicate 1	Replicate 2	Standard Deviation
Volatile Matter	Calculated	%	79.02	79.13	78.92	0.15
Fixed Carbon	Calculated	%	20.98	20.87	21.08	0.15

- Data at www.celignis.com/output/analytical_customer_view.php?editid1=28518

- Data corrected to different bases according to EN 15296:2011 and EN 14918:2009.

Lab Manager Signature:



CELIGNIS LIMITED

Unit 11 Holland Road, Plassey
Tech. Park, Limerick, Ireland

**ALL WORK IS UNDERTAKEN SUBJECT
TO OUR TERMS AND CONDITIONS**

www.celignis.com

info@celignis.com

T: (353) 61 371 725

This report shall not be reproduced except in full without written approval of Celignis Limited

**CERTIFICATE OF ANALYSIS**

Page 3 of 5

Order #
1484Order Status
Order FulfilledReport #
1484-11592-ICPFDate of Report
5th April 2021

Report for: Bernard Carey, Biomass to Biochar Ltd, Derrycon Upper, Mountshannon, Co. Clare, Ireland

Sample Name - Oaten Straw**Ultimate Analysis - Replicate Data**

Test	Method Reference	Average	Replicate 1	Replicate 2	Standard Deviation
Dry Matter Basis (% Dry Mass)					
Carbon	EN 15104:2011	46.06	46.18	45.95	0.17
Hydrogen	EN 15104:2011	5.51	5.52	5.51	0.00
Nitrogen	EN 15104:2011	0.61	0.55	0.68	0.10
Sulphur	EN 15289:2011	0.05	0.05	0.05	0.00
Chlorine	EN 15289:2011	0.89	0.91	0.88	0.03
Oxygen	Calculated	40.75	40.70	40.81	0.08
As-Received Basis (% Wet Mass)					
Carbon	Calculated	30.55	30.63	30.47	0.11
Hydrogen	Calculated	3.66	3.66	3.65	0.00
Nitrogen	Calculated	0.41	0.36	0.45	0.06
Sulphur	Calculated	0.03	0.04	0.03	0.00
Chlorine	Calculated	0.59	0.60	0.58	0.02
Oxygen	Calculated	27.03	26.99	27.06	0.05
Dry Ash-Free Basis (% DAF)					
Carbon	Calculated	49.53	49.66	49.41	0.18
Hydrogen	Calculated	5.93	5.93	5.92	0.01
Nitrogen	Calculated	0.66	0.59	0.73	0.10
Sulphur	Calculated	0.06	0.06	0.05	0.00
Chlorine	Calculated	0.96	0.98	0.94	0.03
Oxygen	Calculated	43.82	43.76	43.88	0.08

- Data at www.celignis.com/output/analytical_customer_view.php?editid1=28518
- Data corrected to different bases according to EN 15296:2011.

Lab Manager Signature:

CELIGNIS LIMITEDUnit 11 Holland Road, Plassey
Tech. Park, Limerick, Ireland**ALL WORK IS UNDERTAKEN SUBJECT
TO OUR TERMS AND CONDITIONS**www.celignis.com

info@celignis.com

T: (353) 61 371 725

This report shall not be reproduced except in full without written approval of Celignis Limited



CERTIFICATE OF ANALYSIS

Page 4 of 5

Order #

Order Status

Report #

Date of Report

1484

Order Fulfilled

1484-11592-ICPF

5th April 2021

Report for: Bernard Carey, Biomass to Biochar Ltd, Derrycon Upper, Mountshannon, Co. Clare, Ireland

Sample Name - Oaten Straw

Stoichiometric Methane Potential (SMP)

Volatile Solids Basis (L per kg VS)

	Biogas	Methane	Carbon Dioxide	% Methane
Calculated from Buswell Equation	924	469	455	50.8

Dry Mass Basis (L per kg Dry Matter)

	Biogas	Methane	Carbon Dioxide	% Volatile Solids
Calculated from Buswell Equation	859	436	423	

As-Received Basis (L per kg Fresh Matter)

	Biogas	Methane	Carbon Dioxide	% Total Solids
Calculated from Buswell Equation	570	289	280	

- Data at www.celignis.com/output/analytical_customer_view.php?editid1=28518
- For Buswell Equation see www.celignis.com/anaerobic-digestion.php#buswell

Lab Manager Signature:

CELIGNIS LIMITED

Unit 11 Holland Road, Plassey
Tech. Park, Limerick, Ireland

**ALL WORK IS UNDERTAKEN SUBJECT
TO OUR TERMS AND CONDITIONS**

www.celignis.com

info@celignis.com

T: (353) 61 371 725

This report shall not be reproduced except in full without written approval of Celignis Limited

Order #
1484

Order Status
Order Fulfilled

Report #
1484-11592-ICPF

Date of Report
5th April 2021

Report for: Bernard Carey, Biomass to Biochar Ltd, Derrycon Upper, Mountshannon, Co. Clare, Ireland

Sample Name - Oaten Straw

Calorific Value - Replicate Data

Dry Matter Basis (MJ/kg)

Test	Method Reference	Units	Average	Replicate 1	Replicate 2	Standard Deviation
Gross Calorific Value	EN 14918:2009	MJ/kg	19.2522	19.2251	19.2793	0.0383
Net Calorific Value	EN 14918:2009	MJ/kg	18.0493	18.0222	18.0764	0.0383

As-Received Basis

Test	Method Reference	Units	Average	Replicate 1	Replicate 2	Standard Deviation
Moisture Content	EN 14774-1:2009	% wb	33.68	32.97	34.40	1.01
Gross Calorific Value	Calculated	MJ/kg	12.7672	12.7492	12.7851	0.0254
Net Calorific Value	Calculated	MJ/kg	11.1465	11.1286	11.1645	0.0254

Dry Ash-Free Basis

Test	Method Reference	Units	Average	Replicate 1	Replicate 2	Standard Deviation
Gross Calorific Value	Calculated	MJ/kg	20.7023	20.6732	20.7314	0.0412
Net Calorific Value	Calculated	MJ/kg	19.4088	19.3797	19.4379	0.0412

- Data at www.celignis.com/output/analytical_customer_view.php?editid1=28518
- The Gross Calorific Value is also known as the Higher Heating Value (HHV).
- The Net Calorific Value is also known as the Lower Heating Value (LHV).
- Data corrected to different bases according to EN 15296:2011 and EN 14918:2009.

Lab Manager Signature:


CELIGNIS LIMITED

 Unit 11 Holland Road, Plassey
Tech. Park, Limerick, Ireland

**ALL WORK IS UNDERTAKEN SUBJECT
TO OUR TERMS AND CONDITIONS**
www.celignis.com
info@celignis.com
T: (353) 61 371 725

This report shall not be reproduced except in full without written approval of Celignis Limited