

BIOCHAR TESTS & SERVICES



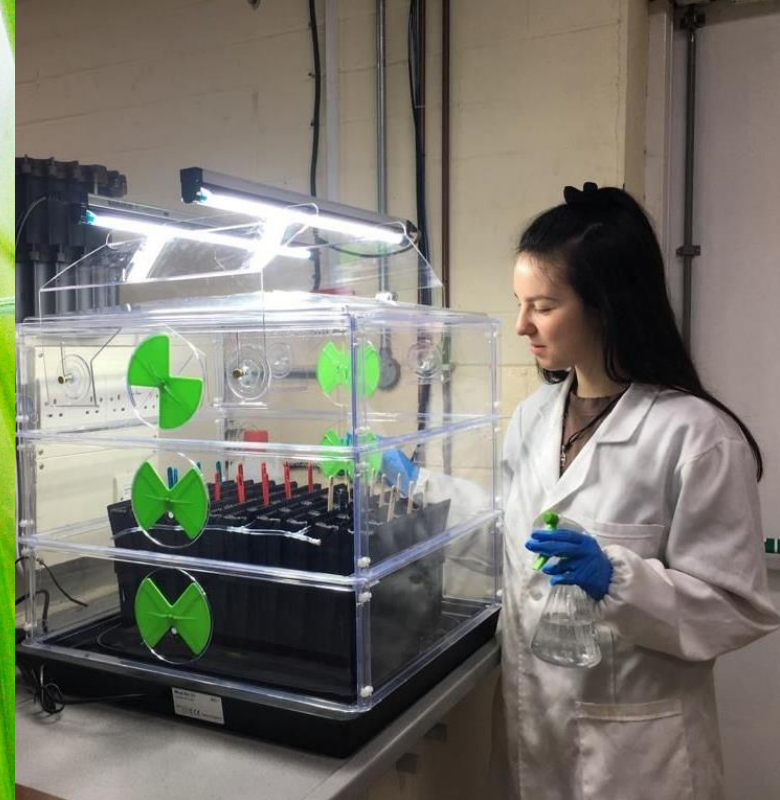
OUR HISTORY



Celignis launched in 2014 as a spin-out of pioneering research undertaken at the University of Limerick in Ireland. Over the subsequent years we have grown rapidly in size and reputation, with a global client base. We now occupy two sites (Celignis Analytical and Celignis Bioprocess) and offer a full spectrum of services for stakeholders looking to valorise biomass and wastes.

Celignis Analytical & Bioprocess

- Wide array of analytical services for biomass and seaweed.
- World-renowned expertise in biogas & anaerobic digestion.
- Bioprocess development services for TRLs 1-6.
- Particular expertise in biological processing of biomass and side-streams (e.g. fermentation, enzymatic hydrolysis etc.)
- A global client base of over 1000 customers.
- Team of qualified (PhD) and passionate biomass experts.
- Partners in multiple international research projects.
- Winner of "Innovation of the Year" award in 2021.



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Analysis and Process
Services for Biochar

www.celignis.com

BIOCHAR ANALYSES



Compositional: Comparison of biological polymers before/after pyrolysis, separate analyses for organic and inorganic carbon.



Thermal: Thermogravimetric analyses (TGA), Ash melting behaviour, Calorific value, Proximate and ultimate analyses.



Soil Amendment: Major and minor elements, Electrical conductivity, Water-Holding capacity, Cation exchange capacity, Plant growth trials, Polycyclic Aromatic Hydrocarbons (PAH), SEM imaging.

Our Services

WE CAN ALSO PRODUCE BIOCHAR

Using a wide range of conditions (e.g. temperature, residence time, heating rate). We can target biochar of the desired specifications for your application sector.

Plant Growth Trials Using Biochar

- Can be run at various scales, ranging from small pots in the lab to large trays in a dedicated greenhouse.
- We consider the effects of various variables, including:
 - Biochar type (from different feedstocks or from one but using different pyrolysis/upgrading conditions).
 - Biochar loading rate.
 - Soil and plant type (e.g. potato, tomato, corn, lettuce).
- Each set of conditions is run in triplicate and compared against a control where no biochar is used.
- Data collected on yield, plant health & soil biology.

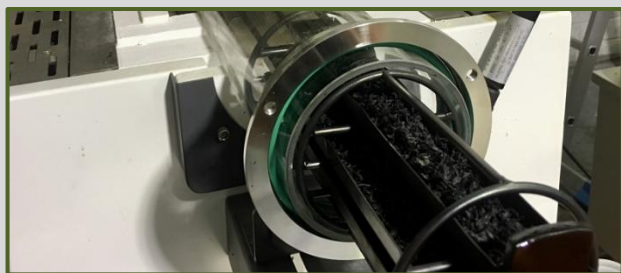
Detailed Reporting & Actionable Data

- Data at your fingertips with the Celignis Database!
- Our reports include personally-written interpretations for some analyses and PASS/FAIL tables where results (e.g. PAHs, heavy metals) are compared against limits from the European Biochar Certificate for various end-uses.

EBC Thresholds Comparisons

EBC Cert. Class	Analyte	Units	Value	EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Consumer Materials	EBC-Basic Materials
Element	H/C _{org}		0.51	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Heavy Metals	Pb	g t ⁻¹	<1	10	45	120	120	120	N/A
	Cd	g t ⁻¹	<1	0.8	0.7	1.5	1.5	1.5	N/A
	Cu	g t ⁻¹	14	70	70	100	100	100	N/A
	Ni	g t ⁻¹	42	25	25	50	50	50	N/A
	Hg	g t ⁻¹	<1	0.1	0.4	1	1	1	N/A
	Zn	g t ⁻¹	273	200	200	400	400	400	N/A
	Cr	g t ⁻¹	74	70	70	90	90	90	N/A
Organic Contam.	As	g t ⁻¹	<1	2	13	13	13	13	N/A
	16 EPA PAH	g t ⁻¹ DM	2.9070	N/A	4 ± 2	6 ± 2.2	N/A	N/A	N/A
	8 EFSA PAH	g t ⁻¹ DM	<0.0001	1.0	1.0	1.0	1.0	1.0	4

- Data at www.celignis.com/output/analytical_customer_view.php?editid1=33297 Lab Manager Signature:
 - Green = below threshold value; Red = above threshold value; Black = Not



Services for Biochar Producers and Users

- Screening of biochar feedstocks.
- Data analysis tools link process and analysis data.
- Assess biochar carbon sequestration potential.
- Approaches to reduce levels of PAHs in biochar.
- Technoeconomic analyses of biochar projects, using analysis and experiment data, considering various production scales and scenarios.
- Collaboration in national/international research.
- Advice, based on analytical and application test results, on suitable markets for a given biochar.



Upgrading Biochar for High-Value Applications

- Physical (heat-treatment) and chemical activation.
- Washing methods tested for soil amendment is end-use.
- Surface functionalization (chemical and biological).
- Blending biochar to produce high-value composites.
- Our approach for upgrading considers your target application sector and initial properties of your biochar.
- Close iterative feedback between analysis and process data allowing optimized upgrading with less experiments.

Physical Analyses of Biochar

- Surface area and pore-size distribution. We use nitrogen or carbon dioxide and give recommendations of suitable end-uses for the biochar based on the data.
- Where different pyrolysis and/or upgrading methods are used we can employ data analysis tools to explore the effect on surface area and pore-size distribution.
- Thermogravimetric analysis for screening biochar feedstocks and testing thermal stability of biochar.

