



Analysis	Method/instrument	<b>Category of service and service provider</b> <i>S</i> - single sample analysis available, R&D cooperation <i>R&amp;D</i> -analysis only in larger R&D cooperation, <i>A</i> -accredited method, single sample analysis available, R&D cooperation	Description
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**Analysis of chemical composition, quantitative and qualitative**

Anions and cations	IC	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	Wastewater, process streams, etc
Antioxidant capacity ABTS	UV-VIS	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	From plants
Antioxidant capacity CURPAC	UV-VIS	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	From plants
Ash content	oven, gravimetry	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	Amount of minerals after incineration
Carbohydrates (sugars)	HPCE, IC/PAD	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	Amount of sugar in biosource
Cellulose	gravimetry or GC-MS	<i>S</i> <i>R&amp;D</i> <i>R&amp;D</i>	Centria NIBIO ATU Sligo	Content of cellulose in biomass or process fractions
Crude protein content	Kjeldahl method	<i>S</i> <i>R&amp;D</i> <i>R&amp;D</i>	Centria NIBIO ATU Sligo	The method measures the total nitrogen, which is then used to estimate the crude protein content by applying a conversion factor to the result. Method suitable for various plants, organic waste streams from food industry, etc.

Identification and quantification of fatty acid analysis	GC-MS/FID		LTU NIBIO	Fatty acid from biomass
Determination of sugars	HPCE, IC/PAD HPAEC-PAD	<i>S</i> <i>R&amp;D</i> <i>R&amp;D</i> <i>R&amp;D</i>	Centria NIBIO ATU Sligo LTU	Applicable to process fractions, side streams, process waters, biomass: wood, plants, waste streams from food industry.
Accelerated extraction system	microwave-assisted synthesis and digestion system	<i>S</i> <i>R&amp;D</i>	Centria ATU Sligo	Microwave-assisted extraction of biomolecules, including cellulose, hemicellulose, proteins and secondary metabolites from biomass.
Kilogram scale fermentation and fractions extraction from biomass	Two-stage Fermentors System	<i>R&amp;D</i>	ATU Sligo	Biological fermentation and online analysis of fermentation products from biomass such as potatoes or maize. In addition to biological catalysts i.e. Enzymes, system offers possibility to use caustic soda, HCl in presence of inert gas.
Aerobic and anaerobic digestion testing	Laboratory Respirometer	<i>R&amp;D</i>	ATU Sligo	To perform testing of digestion with accurate oxygen delivery & generation, with temperature control, suitable for analysis of sludge, wastewater and composting of biomass.
Metal and elemental composition detection	ICPMS ICPOES	<i>S</i> <i>R&amp;D</i> <i>R&amp;D</i>	Centria NIBIO ATU Sligo	Determination of heavy metal content and elemental composition from biomass digestion, contaminated soil, ashes, waste water and impurities in organic matter.
Elemental composition	CHNS combustion analyzer	<i>R&amp;D</i> <i>R&amp;D</i>	ATU Sligo NIBIO	To determine nutritional composition of biomass.
Hemicellulose	gravimetry	<i>S</i>	Centria	
Identification of new materials and their structure	NMR	<i>R&amp;D</i>	LTU	determination of the chemical composition, and structure and dynamics of monomers, oligomers, and polymeric materials; nondestructive technique maintains sample integrity and the analyzed samples can be analyzed by other methods.
Identification of organic compounds and quantification during heating	STA-FTIR	<i>S</i>	Centria	Any homogeneous biomass
Individual anthocyanidins	HPLC	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	cyanidin, delphinidin, petunidin, peonidin, pelargonidin, malvidin
Lignin	gravimetry	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	
Pectines	GC-MS	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	Vegetables, berries, etc.
Screening/identification of organic components	pyrolysis GC-MS GC-MS pyrolysis GC-MS/FID	<i>S</i> <i>R&amp;D</i> <i>R&amp;D</i> <i>R&amp;D</i>	Centria NIBIO ATU Sligo LTU	Fast screening of possible organic compounds from biomass

Small organic acids	HPCE, HPLC-UV	<i>S</i> <i>R&amp;D</i> <i>R&amp;D</i>	Centria NIBIO ATU Sligo	Side streams, process waters, plant products
Total anthocyanin content calculated as cyanidin-3-o-glucoside	HPLC	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	From residues of various plants, e.g. berries, herbs, fruits, grains
Total fat determination	Soxlet, gravimetry	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	Food, feed, biowaste, etc.
Total polyphenolics	UV-VIS	<i>S</i> <i>R&amp;D</i>	Centria NIBIO	From residues of various plants, e.g. berries, herbs, fruits, grains
Amount of gases, CH <sub>4</sub> , CO <sub>2</sub> and H <sub>2</sub>	GC-TCD	<i>R&amp;D</i>	LTU	
Volatile organic compounds (VOC)	GC-MS or GC-FID	<i>S</i> <i>R&amp;D</i> <i>R&amp;D</i>	Centria NIBIO ATU Sligo	From any material
Pesticides in crops,	GC-MS/MS, LC-MS/MS	<i>A</i>	NIBIO	fruit, vegetable and cereals, honey
DNA analysis		<i>A</i>	NIBIO	genetic analyses of mammals, fish, insects and microorganisms
Volatile organic compounds (VOC)	GC-MS or GC-FID	<i>S</i> <i>R&amp;D</i> <i>R&amp;D</i>	Centria NIBIO ATU S Sligo	From any material
<b>Other tests</b>				
Molecular weight of biobased polymers, natural and man made polymers	GPC	<i>R&amp;D</i>	LTU	Natural polymers and polymers made using biobased sources
Leaching Studies of Inorganic and Organic Compounds	Shaker, various identification tools based on component of interest	<i>S</i>	Centria	Leaching of organic and inorganic substances from fly ash, digestates from biogas process, solid waste materials, e.g. when they are landfilled, composted .
Surface tension	OCA	<i>S</i> <i>R&amp;D</i>	Centria LTU	Measurement of contact angle on solid surface or determination of pendant drop shape
Rheology	rotation rheometer	<i>S</i>	Centria	Viscosity of pastes, slurries, viscoelastic properties of natural polymers at relevant temperatures, shear rates.
Thermal stability	TGA, STA-FTIR, ovens and furnaces	<i>S</i> <i>R&amp;D</i>	Centria ATU Sligo	Weight loss during thermal degradation, weight loss/gain during oxidation, ageing behaviour
Characteristic temperatures of materials and processes	DSC	<i>S</i>	Centria	Characteristic temperatures and heat of change in materials: melting, glass transition, crystallization, decomposition, oxidation, chemical reaction; specific heat capacity, calorific value, kinetics of reactions

Environmental ageing	QUV(temp., spray), Xenon (temp.),SUNTEST XLS+, climatic chambers	<i>S</i> <i>R&amp;D</i>	Centria ATU Sligo	Chambers up to 54m3 size,-60°Cto +120°C, up to 95% RH
Partical size	DLS	<i>S</i>	Centria	Various slurries, powders
Partical size, charge and/or molecular weight	DLS, Zetasizer	<i>R&amp;D</i>	LTU	Various slurries, powders
Imaging of surfaces	SEM, microscopes	<i>S</i> <i>R&amp;D</i>	Centria LTU	