IBI Biochar Certification Program

List of Participating Laboratories (United States)

Version - Phase 1
Last Updated: April 2016

NOTE: The following is a listing of laboratories that IBI knows to be conducting the required tests necessary for certification as part of the IBI Biochar Certification Program. By listing these laboratories, IBI confers no endorsement or quality assurances regarding these laboratories, nor does it make any claims regarding the validity of the laboratory or its test results. This listing is offered to allow manufacturers to more easily identify laboratories willing to do the requisite tests, and will be updated at least quarterly. Biochar manufacturers/applicants are not required to use laboratories that IBI lists, and are free to select a laboratory of their choice as long as the laboratory(ies) selected are appropriately licensed, professionally accredited, and follow IBI-required test methodologies. By making use of a laboratory for the required testing, participating biochar manufacturers agree to defend and hold IBI harmless from and against any and all claims, actions, demands, liabilities, losses, settlements, costs and fees (including, without limitation, reasonable attorneys' fees and court costs) arising from or allegedly arising from any results of laboratory testing.

For further information about the *IBI Biochar Certification Program* see our webpage: **http://www.biochar-international.org/certification**

	Control Laboratory	Summit Environmental Technologies, Inc.	Texas Element, Inc.	Midwest Laboratories, Inc.	Situ Biosciences LLC
URL:	www.biocharlab.com	www.summitlabs.org	http://www.texaselement.com/	https://www.midwestlabs.com/	http://www.situbiosciences.com/
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CITY:	Watsonville	Albuquerque	Austin	Omaha	Wheeling
STATE:	California	New Mexico	Texas	Nebraska	IL
COUNTRY:	USA	USA	USA	USA	USA
NOTES:	Can conduct all tests except: PAH, PCCD/F, and PCB, and surface area	Can conduct all category B tests except Germination Inhibition Assay and chlorine	Can conduct all tests	Can conduct all category A tests except: liming; all category B tests except germination, PAH, PCCD/F, and PCB; and all category C tests except total and external surface area	Can conduct all category A tests except liming; all category B tests except PAH, PCCD/F, and PCB; and in category C only volatile matter

TABLE 1. Test Category A – Basic Utility Properties (required for all biochars)

Requirement	Test Method	Control Lab	Summit	Texas Element	Midwest	Situ Biosciences
Moisture	ASTM D1762-84 (specify measurement date with respect to time from production)	Yes	No	Yes	Yes	Yes
Organic Carbon	Total C and H analysis by dry combustion-IR detection. Inorganic C analysis by determination of CO2-C content with 1N HCl, as outlined in ASTM D4373 Standard Test Method for Rapid Determination of Carbonate Content of Soils. Organic C calculated as Total C – Inorganic C.	Yes	No	Yes	Yes	Yes
$H:C_{org}$		Yes	No	Yes	Yes	Yes
Total Ash	ASTM D1762-84	Yes	No	Yes	Yes	Yes
Total Nitrogen	Dry combustion-IR detection following the same procedure for total C and H above.	Yes	No	Yes	Yes	Yes
pH	pH analysis procedures as outlined in section 04.11 of TMECC (2001) using modified dilution of 1:20 biochar:deionized H2O (w:v) and equilibration at 90 minutes on the shaker, according to Rajkovich et al. (2011).	Yes	No	Yes	Yes	Yes
Electrical Conductivity	EC analysis procedures as outlined in section 04.10 of TMECC (2001) using modified dilution of 1:20 biochar:deionized H2O (w:v) and equilibration at 90 minutes on the shaker, according to Rajkovich et al. (2011).	Yes	No	Yes	Yes	Yes
Liming (if pH is above 7)	AOAC 955.01 potentiometric titration on “as received” (i.e., wet) samples. Use dry weight to calculate % CaCO3 and report “per dry sample weight”.	Yes	No	Yes	No	No
Particle size distribution	Progressive dry sieving with 50 mm, 25 mm, 16 mm, 8mm, 4mm, 2 mm, 1 mm, and 0.5 mm sieves.	Yes	No	Yes	Yes	Yes

TABLE 2. Test Category B – Biochar Toxicant Reporting (required for all biochars)

Requirement	Test Method	Control Lab	Summit	Texas Element	Midwest	Situ Biosciences
Germination Inhibition Assay	see Tables 4. and 5. below	Yes	No	Yes	No	Yes
Polycyclic Aromatic Hydrocarbons (PAHs)	see Tables 4. and 5. below	No	Yes	Yes	No	No
Dioxins/Furans (PCCD/Fs)	see Tables 4. and 5. below	No	Yes	Yes	No	No
Polychlorinated Biphenyls (PCBs)	see Tables 4. and 5. below	No	Yes	Yes	No	No
Arsenic	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Cadmium	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Chromium	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Cobalt	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Copper	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Lead	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Molybdenum	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Mercury	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Nickel	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Selenium	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Zinc	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Boron	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes
Chlorine	see Tables 4. and 5. below	Yes	No	Yes	Yes	Yes
Sodium	see Tables 4. and 5. below	Yes	Yes	Yes	Yes	Yes

TABLE 3. Test Category C – Advanced Analysis and Soil Enhancement Properties (optional for all biochars)

Requirement	Test Method	Control Lab	Summit	Texas Element	Midwest	Situ Biosciences
Mineral N (ammonium and nitrate)	2M KCl extraction, followed by spectrophotometry (Rayment and Higginson 1992)	Yes	No	Yes	Yes	No
Total Phosphorus & Potassium (P&K)*	Modified dry ashing followed by ICP (Enders and Lehmann 2012)	Yes	No	Yes	Yes	No
Available P	2% formic acid followed by spectrophotometry (Wang et al 2012)	Yes	No	Yes	Yes	No
Volatile Matter	ASTM D1762-84	Yes	No	Yes	Yes	Yes
Total Surface Area	ASTM D 6556-10 Standard Test Method for Carbon Black – Total and External Surface Area by Nitrogen Adsorption	No	No	Yes	No	No
External Surface Area		No	No	Yes	No	No

TABLE 4. Test Category B Allowable Test Methods (see TABLE 5. for expanded description of each method)

Requirement	Test Method					
	Digestion Method				Determination Method	
	Digestion1	Digestion2	Digestion3	Digestion4	Determination1	Determination2
Germination Inhibition Assay	OECD methodology (1984) using three test species, as described by Van Zwieten et al. (2010)	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons (PAHs)	EPA 8270 (2007) using Soxhlet extraction (US EPA 3540) and 100% toluene as the extracting solvent	-	-	-	-	-
Dioxin/Furan (PCDD/Fs)	EPA 8290	-	-	-	-	-
Polychlorinated Biphenyls (PCBs)	EPA 8275	EPA 8082	-	-	-	-
Arsenic	TMECC 04.12-A	TMECC 04.12-B	-	-	EPA 7000	-
Cadmium	TMECC 04.12-A	TMECC 04.12-B	TMECC 04.12-E	-	EPA 7000	EPA 6010
Chromium	TMECC 04.12-A	TMECC 04.12-B	TMECC 04.12-E	-	EPA 7000	EPA 6010
Cobalt	TMECC 04.12-A	TMECC 04.12-B	TMECC 04.12-E	TMECC 04.12-D	EPA 7000	EPA 6010
Copper	TMECC 04.12-A	TMECC 04.12-B	TMECC 04.12-E	-	EPA 7000	EPA 6010
Lead	TMECC 04.12-A	TMECC 04.12-B	TMECC 04.12-E	-	EPA 7000	EPA 6010
Mercury	TMECC 04.12-A	-	-	-	TMECC 04.13-A	-
Molybdenum	TMECC 04.12-A	TMECC 04.12-B	TMECC 04.12-E	-	EPA 7000	EPA 6010
Nickel	TMECC 04.12-A	TMECC 04.12-B	TMECC 04.12-E	-	EPA 7000	EPA 6010
Selenium	TMECC 04.12-A	TMECC 04.12-B	-	-	EPA 7000	EPA 6010
Zinc	TMECC 04.12-A	TMECC 04.12-B	-	-	EPA 7000	EPA 6010
Boron	TMECC 04.12-A	TMECC 04.12-B	TMECC 04.12-D	-	EPA 6010	-
Chlorine	TMECC 04.12-D	-	-	-	ion chromatography (per manufacturer instructions)	ion-selective electrode (per manufacturer instructions)
Sodium	TMECC 04.12-A	TMECC 04.12-B	TMECC 04.12-E	TMECC 04.12-D	EPA 7000	EPA 6010

TABLE 5. Key to Test Methods in Test Category B (see TABLE 4)

Category B Test Methods		
Method Number	Name	Adapted from
EPA 8290	Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (HRGC/HRMS)	n/a
EPA 8275	Semivolatile Organic Compounds (PAHs and PCBs) in Soils/Sludges and Solid Wastes Using Thermal Extraction/Gas Chromatography/Mass Spectrometry (TE/GC/MS)	n/a
EPA 8270	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	n/a
EPA 8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	n/a
TMECC 04.12-A	microwave assisted nitric acid digestion for compost	EPA 3051 microwave assisted acid digestion of sediments, sludges, soils and oils
TMECC 04.12-B	nitric acid digestion of compost and soils	EPA 3050 acid digestion of sediments, sludges, and soils
TMECC 04.12-C	dry ash sample digestion for plant nutrients	AOAC method 985.01
TMECC 04.12-D	water soluble elements	n/a
TMECC 04.12-E	aqua regia procedure	n/a
EPA 7000	flame atomic absorption spectrophotometry	n/a
EPA 6010	inductively coupled plasma - atomic emission spectroscopy	n/a
TMECC 04.13-A	cold vapor AAS technique for mercury in compost	EPA 7470A mercury in liquid waste (manual cold vapor technique)