



ECOCHAR®

GREEN INFRASTRUCTURE WATER FILTRATION & BIOADSORPTION TREATMENT MEDIA

PRODUCT SPECIFICATIONS

Ecochar Trademarked biochar is a safely processed (carbon negative sequestration patented gasification technology) biomass-based soil conditioner and green infrastructure amendment and treatment. When mixed with soil or soil and compost, it increases overall health, porosity, and water filtration and holding capacity, while treating pollutants and eliminating harmful leachates. It enhances healthy plant growth naturally through non-leachable bioavailable phosphorus and minerals. Plants and crops prosper and stay healthy. This product will permanently add carbon to your soil. It also enables beneficial reuse of organic waste streams, thereby better protecting water quality and public health.

Description: Ecochar® is a trademarked biochar produced through a patented gasification technology process at temperatures ranging from 1200 degrees F to 1800 F. Ecochar® is a solid carbonaceous adsorbent material obtained from the thermochemical conversion of biomass in an oxygen-limited environment.

Ecochar® is a predominantly stable, recalcitrant organic carbon (C) compound safely processed from a variety of biomass feedstocks – manure (M), plant (P), wood (W), bone (B), biosolids (BS) and can be used as soil amendments, conditioners and nature-based water and soil pollutant treatments. When mixed with soil, it increases soil health, porosity, and water filtration and holding capacity, while treating pollutants, with the additional bioremediation benefits of healthy biofilm microorganisms that further break down unwanted constituents. It enhances healthy plant growth naturally through non-leachable bioavailable phosphorus and minerals. Plants and crops prosper and stay healthy. This product will permanently add carbon to your soil. It also enables beneficial reuse of organic waste streams, thereby better protecting water quality and public health.

Ecochar® can be used alone, in combination with other Ecochars or as an ingredient within a blended product, with a range of applications as an agent for soil improvement, improved resource use efficiency, remediation and/or protection against particular environmental pollution, and as an avenue for greenhouse gas (GHG) mitigation. (International Biochar Initiative (IBI) Definition & Standard). It can also be used for storm water treatment or liquid phase filtration to remove organic and inorganic species, including heavy metals. Can be used in numerous water filtration and infiltration designs and in combination with a variety of structural or non-structural low impact stormwater best management practices.

APPLICATIONS: Ecochar is an excellent media for enhanced stormwater filtration, retention and bio-adsorption treatment of toxics and other pollutants. As a soil treatment and conditioner, it also improves performance of green infrastructure – expediting healthy green growth, improving soil porosity, water retention and microbial activity. It is available in a coarse to fine grained charcoal product that conditions the soil and enhances the soil’s chemical and physical properties improving plant health and growth, while reducing and eliminating organic and inorganic pollutants. The product can be used to:

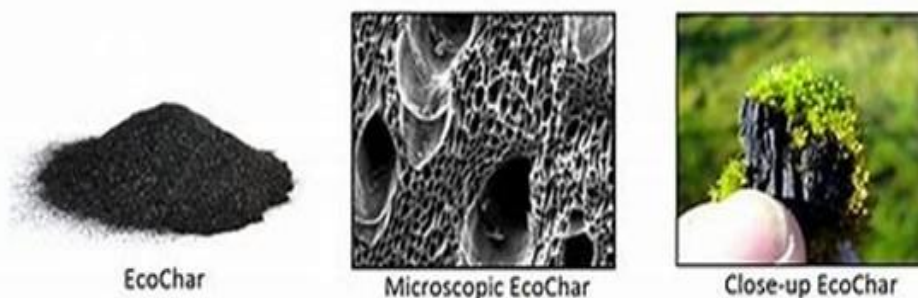
- ✓ Improve soil fertility and soil health, reducing fertilizer requirements
- ✓ Enhance soil porosity, water filtration, retention and nutrient holding capacity
- ✓ Reduce nutrient runoff and leaching in water treatment applications
- ✓ Bind heavy metals and other pollutants in treating soil and water
- ✓ Reduces soil erosion and degradation
- ✓ Provide a home for beneficial soil microbes including mycorrhizal fungi
- ✓ Put carbon back into the soil – locking up atmospheric carbon and sequestering it in the soil also making it a viable solution to reduce and offset GHG emissions.
- ✓ Increase soil cation exchange capacity and soil pH
- ✓ Add to compost and mulches to stimulate microbial activity
- ✓ Blend with other natural fertilizers to improve availability and reduce loss.

Application rates will vary depending on soil and mixed aggregate types (e.g., gravel, stone, compost, etc.), vegetation and environmental pollutant treatment needs. For a general application purposes application guide:

- For Soil Conditioning & Improvement - Water Capture/Holding: 1-2% volume to the root zone (Note that Ecochar can increase water holding capacity by 2-5 times its weight depending upon the feedstock.
- For Structural Improvement to Clay and Sandy Soils: 5-10% to the root zone
- For Soil & Water Detoxification & Pollutant Treatment: 2-20% to treated depth depending upon types of pollutants & concentrations
- For mixing with composts, mix biochar at approximately 1-10% of volume.

Ecochar® Porosity and Sorption Capacity

Scanning electron microscope showing Ecochar 1000 Xs magnified. Numerous pores provide high surface area, nutrient and water holding capacity, along with mineral lined surfaces that strongly bind toxics.





E-PRODUCTS: Ecochar biochar charcoal-like is a biomass (agri-manure, plant, wood) based soil amendment and conditioner, high in quality and high in carbon content.

Parameter	Ecochar M; Ecochar P; Ecochar W
Product Name:	Ecochar®
Feedstock:	Animal manure; Plant; Wood
Production Process:	Gasification – Coaltec/Earthcare Energy-Patented Technology – Temperatures – 1200 Fahrenheit -1800 Fahrenheit
Size:	Predominantly less than <0.3 cm in dimension -
Composition:	Natural charcoal
Chemicals and binding agents:	There are no added chemicals or binding agents
Average Fixed Carbon (%)	~ 15-30%
Inherent Moisture (%)	~10-20%
Average Ash (%)	~35-55%
Total Carbon (%)	~25-45%
Nitrogen (%)	~1.9-2.4
Sulphur (%)	~.05-1.6
Average Surface Area (m ² /g)	~150 – 200
pH	9-11
Infiltration Rate or Hydraulic Loading Capacity	Site Specific
Densities	550 lbs – 800 lbs/CY depending upon feedstock
Types	Ecochar M; Ecochar P; Ecochar W; Ecochar BS
Ecochar M & Ecochar M-A (Activated)	Animal Manure Feedstocks – Egg Layer, Turkey, Chicken, Cow, Pig, Horse Muck [As a result of high temperature gasification processing, all Ecochars are pathogen-free, hormone-free, and residue & medication-free]
Ecochar P	Plant Biomass – Agricultural Debris
Ecochar W	Wood Biomass – Hard & Soft Woods
Ecochar BS	Biosolids [As a result of high temperature gasification processing, all Ecochars are pathogen-free, hormone-free, and residue & medication-free]

Purchasing

Ecochar® shall be purchased from approved, certified suppliers (provided by Ecochar Environmental Solutions, LLC). Address: 78 John Miller Way, Kearny, NJ 07032; Telephone: (812) 455-4568; Mike@ecocharenvironmentalsolutions.com or Dominique@ecocharenvironmentalsolutions.com.

Material

The Ecochar® media shall be manufactured from the treatment and carbonization of selected biomass feedstocks, such as manure, animal bone, plant, wood, biosolids and specified as such. The final product is available in a variety of sizes ranging from coarse granular (8X24 mesh) to small and fine (powder). The product has an average dry unit weight of 440 lbs. – 720 lbs. per cubic yard, depending upon the Ecochar and feedstock. It is typically shipped with a dry weight of 80-90%. It is inert and 100% stable.

Climate-Friendly Benefits

Each cubic yard (CY) of Ecochar® media can be certified for at least 0.5 Carbon Credits (CO₂ Equivalent).

Pollutant Removal

Ecochar®M media and patent-pending activated media (Ecochar®M-A) have dissolved phosphorus (DP) removal capacities that exceed a range of 12 mg DP/gram – 50mg DP/gram of media as measured in the laboratory during normal operating conditions. Ecochar Environmental Solutions, LLC. will provide certification of authenticity on the above compositions and performance.

Ecochar®M media has been lab tested for significant heavy metals adsorption with 99.9% removal efficiencies (within detectable limits) for lead, zinc, cadmium, copper, nickel, chromium, and arsenic, along with other organic and inorganic constituents for significant pollutant concentration levels. Ecochar Environmental Solutions, LLC. can provide certification of authenticity on the above composition and performance.

Delivery

Delivery of the specified Ecochar® material: Ecochar® media will be delivered to the jobsite in 2-2.5 CY super sacks – depending on the Ecochar®. Weight ranges from approximately 550 lbs. – 800 lbs. per CY depending upon the specified Ecochar® as per the feedstock.

Storage and Handling

The material can be stockpiled and covered with no expiration before installation.
Prep: No Onsite prep or mixing is required.

Installation

Surface on which the Ecochar media is placed shall be reasonably smooth and within ± 1 inch of the elevations shown in the plans. The surface of the Ecochar media shall be placed loosely or compacted to meet the requirements as specified by the design engineer.

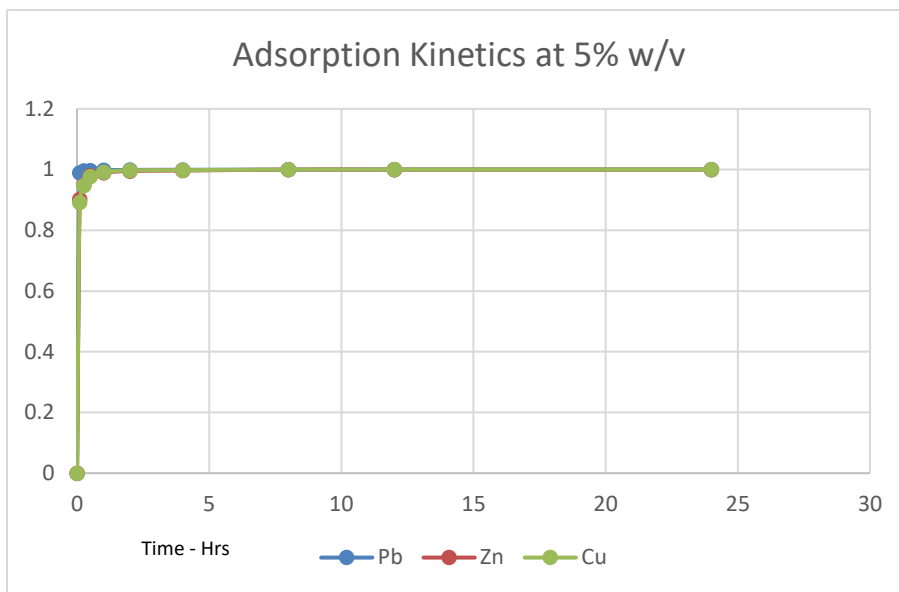
The Ecochar media may be placed in layers and compacted to the density specified in the plan by the design engineer. The compacted thickness will be no less than the thickness shown in the plans. Clean water with no contaminants may be added to the material to meet the compaction requirements.

Heavy Metals Adsorption Capacities – Copper, Zinc, Lead

Metals Adsorption Capacities for Ecochar*M at 5% Ecochar (Weight/Volume) – Cu; Zn;Pb

Constituent	Constituent Concentration (mg/L)	Ecochar-M* Adsorption Capacity (mg metal/g media)	Ecochar-M* (% Adsorbed)	Ecochar-M* (Adsorption or Contact Time)
Copper	98.37	49.19	89%	6 min or less
Zinc	98.83	49.41	90%	6 min or less
Lead	492.5	246.0	99%	6 min or less

*Ecochar-M hydraulic loading rate = 100-118 in³/hr; 8x24 mesh; pH = 10.6



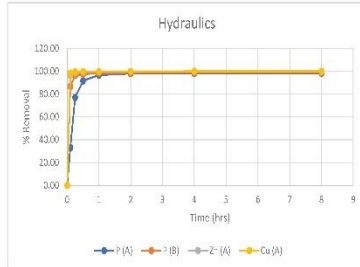
Adsorption Kinetics at 5% w/v Ecochar							
Sample	Pb	Zn	Cu	Sample	Pb	Zn	Cu
0 hr	492.55	98.83	98.374	0	0	0	0
0.1	4.952	9.63	10.69	0.1	98.99%	90.26%	89.13%
0.25	1.959	4.99	5.18	0.25	99.60%	94.95%	94.73%
0.5	1.172	1.97	2.23	0.5	99.76%	98.01%	97.73%
1	0.86	0.99	0.767	1	99.83%	99.00%	99.22%
2	0.54	0.45	0.25	2	99.89%	99.54%	99.75%
4	0.29	0.32	0.17	4	99.94%	99.68%	99.83%
8	0.11	0	0	8	99.98%	100.00%	100.00%
12	0	0	0	12	100.00%	100.00%	100.00%
24	0	0	0	24	100.00%	100.00%	100.00%
Max Ads (mg/gm)	246.275	49.415	49.187				

Ecochar M-Activated A & Activated B Performance Results- Hydraulic Adsorption Testing & Analyses for Treatment of Phosphorus, Zn & Cu

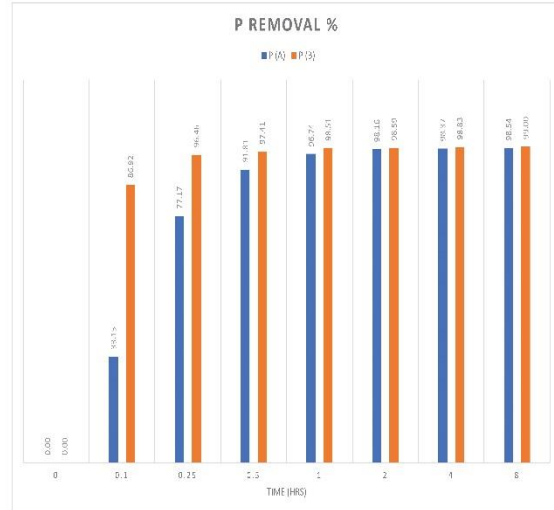
Ecochar M-Activated A & Activated B Performance Results- Hydraulic Adsorption Testing & Analyses for Treatment of Phosphorus, Zn & Cu*

Concentrations (ppm)				
Time (hr)	P (A)	P (B)	Zn (C)	Cu (C)
0	64.9397	65.3685	107.6571	92.6244
0.1	43.4148	8.5506	3.989	1.3872
0.25	14.825	2.317	1.426	.461
0.5	5.319	1.692	.792	.217
1	2.115	.973	.316	.17
2	1.196	.921	.126	.09
4	1.057	.768	.0123	0
8	.947	.651	.0111	0

Flow Rate = 30 mL/min = 110 in³/hr for all three ratios
A higher flow rate may be possible.



Time (hr)	P (A)	P (B)	Zn (A)	Cu (A)
0	0.00	0.00	0.00	0.00
0.1	33.15	86.92	96.29	98.50
0.25	77.17	96.46	98.68	99.50
0.5	91.81	97.41	99.26	99.77
1	96.74	98.51	99.71	99.82
2	98.16	98.59	99.88	99.90
4	98.37	98.83	99.99	100.00
8	98.54	99.00	99.99	100.00



Ecochar A - 98.5 % Removal Efficiency for P; 99.99 Removal Efficiency for Zn; 100 % Removal Efficiency for Cu
Ecochar-B - 99.0 % Removal Efficiency for P; 99.99 % Removal Efficiency for Zn; 100 % Removal Efficiency for Cu

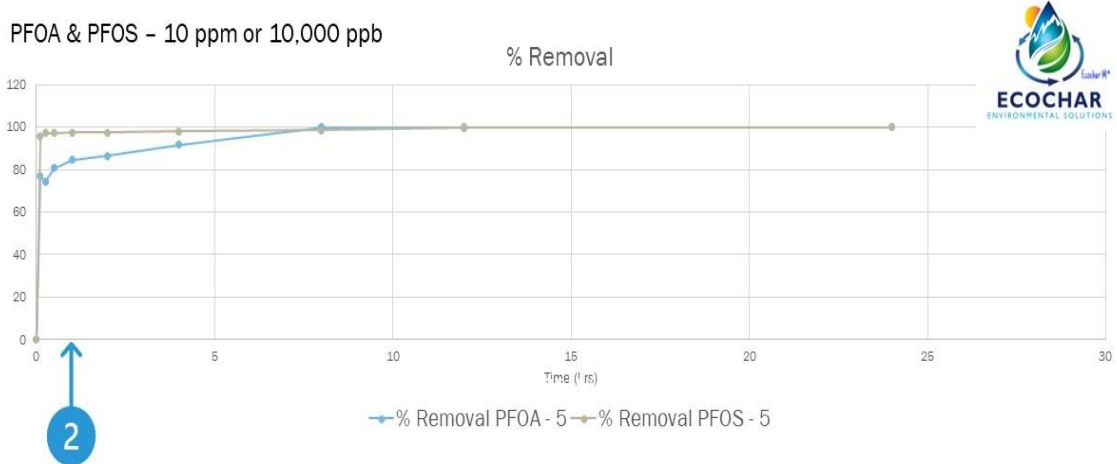


ECOCHAR
ENVIRONMENTAL SOLUTIONS

*Testing and analyses performed by:
Sameer Neve, PhD Candidate- Environmental Engineering
Stevens Institute of Technology, NJ

Contact dominique@ecocharenvironmentalsolutions.com for more information.

Ecochar M-5 Treatment of PFOA and PFOS – 100% Removal Efficiencies



PFOA PFOS RESULTS* – 1% ECOCHAR-M/5 TREATMENT

*100 % Removal Efficiency
for Both PFOA & PFOS

ECOCHAR ENVIRONMENTAL SOLUTIONS



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