

# Biochar based Activated Carbon



# William F. Naylor

## Activated Carbon Expert

Accredited Member

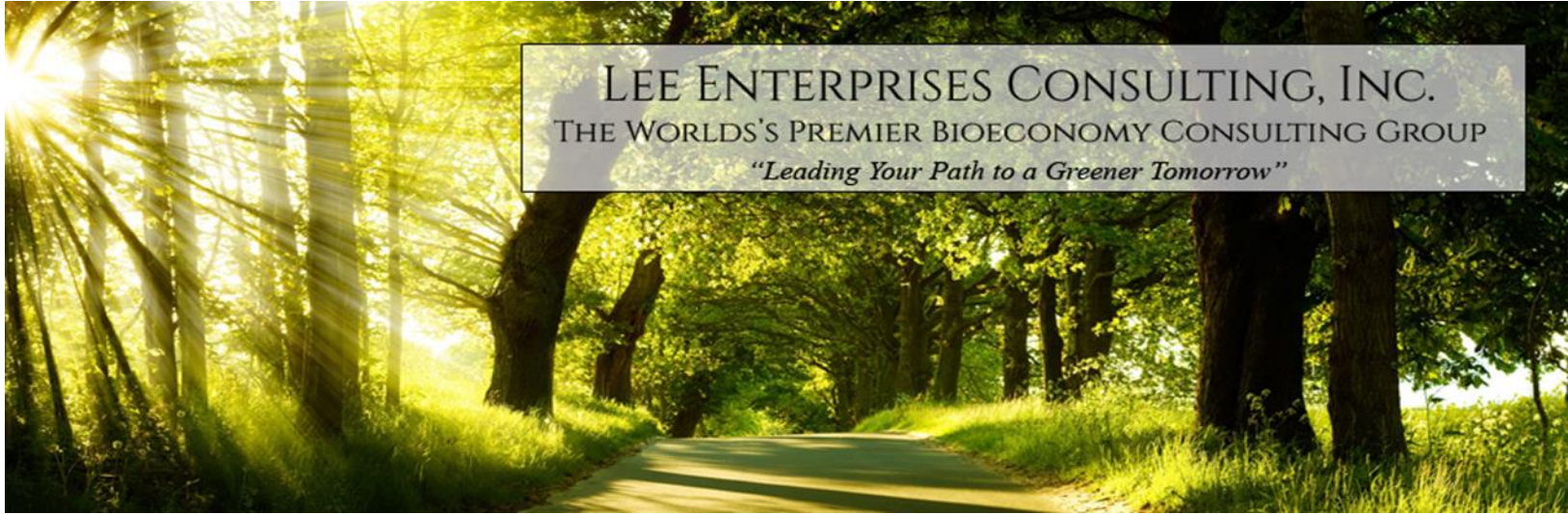


LEE ENTERPRISES  
CONSULTING, INC.

**Over 25 years of experience in working with environmental protection technologies having established expertise in activated carbon for all water, wastewater, and gas phase systems**

**Performing consulting services and advisor to manufacturers and investors both in the US and internationally**

**Advisor to the EPA and former Chair of the AWWA Activated Carbon Standards Committee.**



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**Expertise: World's largest bioeconomy consulting group - over 100 subject matter experts (SME's)- all areas of the bioeconomy.**

**Approach: Project interdisciplinary teams to meet exact needs of specific projects.**

**POC: Handle projects with one agreement and single point of contact.**

**Cost Advantage: Single POC = lower administrative costs = lower project cost.**

# Naylor Consulting

Strategic Partner



LEE ENTERPRISES  
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# William Naylor

## ▶ Activated Carbon subject matter consultant

- ▶ Municipalities      Plant expansion, product integration, filtration upgrades
- ▶ Engineering firms      System design/review, product selection
- ▶ Manufacturers      Advise on products & properties, field testing, and market development

## ▶ Speaker - Technical Presentations and Training

- ▶ American Waterworks Association      (AWWA)
- ▶ Water Quality and Technology Conference      (WQTC)
- ▶ Master Brewers Association of Americas      (MBAA)
- ▶ Aquatic Animal Life Support Operators      (AALSO)
- ▶ Louisiana Department of Health      (LaDHH)
- ▶ Texas Commission on Environmental Quality (TCEQ)

# William Naylor

## ▶ Publications and peer reviews

- ▶ *Lignite vs. Bituminous GAC for Biofiltration*
- ▶ *Empty Bed Contact Time and Its Relationship to Activated Carbon Adsorption*
- ▶ *Granular Activated Carbon Unit Cost Model; U.S. EPA*
- ▶ *Characteristics of Ground Granular Activated Carbon for Rapid Small Scale Column Tests*

## ▶ Technical papers

- ▶ **Commonly Asked Questions on Odor Control System Design**
- ▶ **Recommended Bid Specifications for Municipal Water Treatment**
- ▶ **Ultrapure Water Purification**
- ▶ **Powdered Activated Carbon in Potable Water Purification**
- ▶ **Granular Activated Carbon in Potable Water Treatment**
- ▶ **Chlorine Dioxide Use in Potable Water Treatment and Reactions with Activated Carbon**
- ▶ **Powdered Activated Carbon Storage and Handling**
- ▶ **Scaling in Powdered Activated Carbon (PAC) Feed Systems**
- ▶ **Isotherm Project**

# What is Activated Carbon

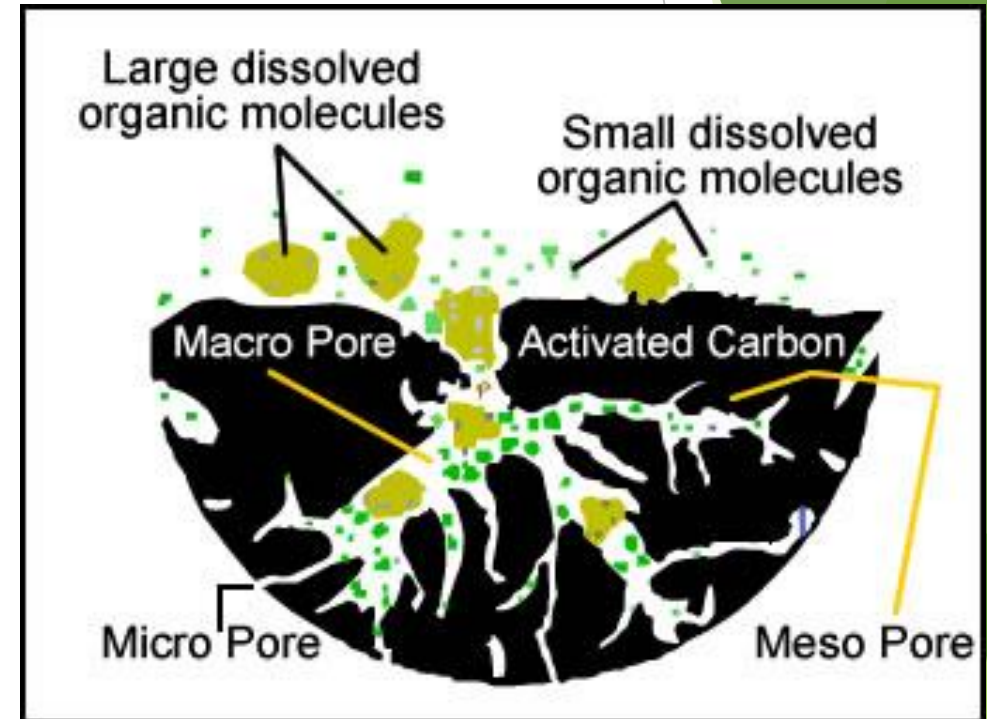
- ▶ Carbon-based porous material
- ▶ Porosity is the size of atoms and molecules
- ▶ A purification media (liquid and gas)
- ▶ The active agent in a separation process

Raw Materials include:

- ▶ Wood / woody biomass

Biochar-based activated carbon use is increasing in major application areas including agriculture and water treatment

- ▶ Lignite Coal
- ▶ Bituminous Coal
- ▶ Coconut Shells



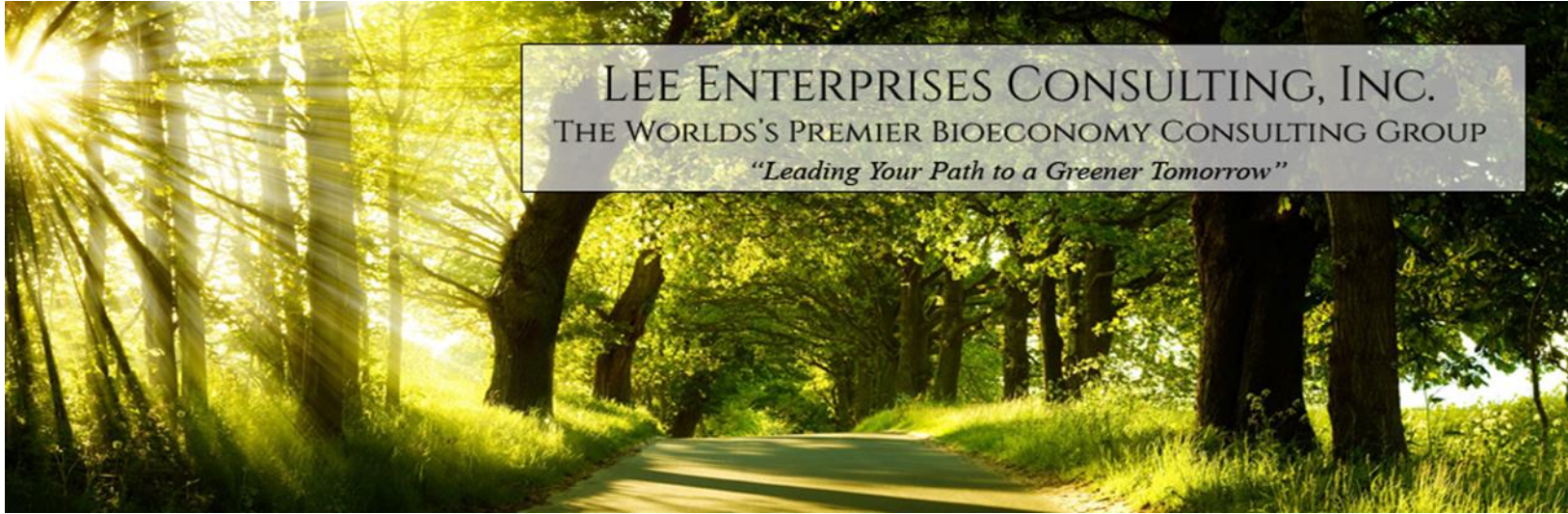
# Advantages of biochar-based activated carbons

## Advantages

- ▶ Good porosity = faster adsorption
- ▶ High purity / low ash
- ▶ Lower density = lower cost on volumetric basis
- ▶ Metal adsorption is superior in certain conditions
- ▶ Well suited for biological systems, i.e. high COD reduction
- ▶ Can be certified 'Organic', i.e. CDFA, etc.
- ▶ Renewable and sustainable raw material
- ▶ Ion exchange properties







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