

## Comparing Coconut Shell-Based and Coal-Based Activated Carbons

### Frequently Asked Questions

#### Why are coconut shells used to produce activated carbon?

Due to their high carbon content and hardness, coconut shells are an excellent raw material source to produce activated carbon. Activated carbons that are produced using coconut shells as the raw material are often sourced in geographic regions where coconuts are harvested, including India, Malaysia, Sri Lanka, and the Philippines.

#### How is coconut shell-based activated carbon produced?

Raw material coconut shells are first charred at the coconut grower or at a centralized facility designed to produce char. Activated carbon manufacturers then purchase the char and activate it at elevated temperatures and using steam in a kiln or furnace, similar to the process for coal-based activated carbons. The final product is screened to a variety of mesh sizes for both vapor phase and liquid phase applications.

#### How do the characteristics of coconut shell-based carbons compare to those for coal-based carbons?

Activated carbons produced from coconut shells typically have a tighter, more microporous pore structure than their coal-based counterparts. This is due to the inherent pore structure of the raw material coconut shell as compared to raw material coals. This microporosity lends itself towards certain applications where activated carbon is used.

Also, coconut shell-based carbons tend to be harder, more resistant to abrasion, and lower in ash than similar grades of coal-based carbons. A quick comparison of standard specification measures on coconut shell carbons versus coal carbons is as follows:

Parameter	Aqueous Phase		Vapor Phase	
	Coal-Based	Coconut-Based	Coal-Based	Coconut-Based
Iodine No., mg/g	900-1000	1100-1200	-	-
Butane Activity	-	-	22-25	23-28
Carbon Tetrachloride Number	-	-	55-64	60-71
Abrasion Number	75-80	80-85	-	-
Hardness Number	-	-	90-95	95-98
Ash, Wt. %	10-15	4-6	12-15	4-6
Apparent Density, g/cc lb/ft <sup>3</sup>	0.46-0.63 29 - 39	0.45-0.52 28 – 32.5	0.47-0.53 29 - 55	0.45-0.52 28 -32.5

### **What applications can coconut shell-based carbon be used for?**

Many of the applications where coal-based carbons have been traditionally used are potentially good applications for coconut shell-based carbon as well. In particular, the removal of trace level organics from water streams with little to no background TOC levels is a good fit for coconut-based carbon's microporous structure. In vapor phase applications, VOC abatement and solvent recovery (for light molecular weight organics) are good fits for coconut-based carbons.

Not every application is a good fit for coconut-shell based carbons; applications such as surface water treatment with high background TOC levels, wastewater treatment, decolorization, and the removal of bulky, high molecular weight organics from liquid or air streams tend to favor coal-based carbons.

### **Can coconut shell-based carbons be used for drinking water treatment?**

Yes. Siemens has a long history of applying coconut shell-based carbons for drinking water treatment and several customers are evaluating coconut-shell based carbons today as a potential alternative to coal-based materials. Our full line of coconut-based carbons meets ANSI / NSF Standard 61 and AWWA B604-05 standards for drinking water treatment.

### **What grades of coconut shell-based carbons are available?**

Siemens offers several types of standard coconut shell-based carbons as part of our product offering, including:

- **AquaCarb® 1230C** – high activity 12x30 mesh, used for drinking water treatment and groundwater remediation applications. A potential replacement for both 8x30 and 12x40 mesh coal-based carbons.
- **AquaCarb® 1240C** – high activity 12x40 mesh product intended as a drop-in replacement for 12x40 coal based carbons used for drinking water treatment and groundwater remediation applications.
- **AquaCarb® 830C** – high activity 8x30 mesh product intended as a drop-in replacement for 8x30 coal based carbons used for drinking water treatment and groundwater remediation applications.
- **AquaCarb® 1230AWC / 1240AWC** – an acid washed 12x30 / 12x40 mesh product targeted for high purity water applications. A potential replacement for 8x30 and 12x40 mesh acid washed coal-based carbons.
- **VOCarb® 48C** – 4x8 mesh product for vapor phase applications (VOC abatement and solvent recovery). A potential replacement for 4x10 granular coal-based carbon.
- **VOCarb® 36C** – 3x6 mesh product with low pressure drop characteristics. A potential replacement for 4mm pelletized or 4x6 granular coal-based carbons.

### **Can coconut-based carbon be reactivated?**

Yes. The procedures for obtaining approval for reactivation at one of Siemens' three reactivation facilities are exactly the same as with coal-based carbons.

### **What services are available with coconut-based carbons?**

Siemens offers a complete line of field services including: spent carbon profiling, spent carbon removal and packaging, non-hazardous and/or hazardous waste handling / transportation to our reactivation plant or a hazardous waste reactivation plant, vessel inspection with minor repair, vessel reloading with replacement carbon.

If you have traditionally used coal-based carbon in your application, Siemens can assist you in evaluating whether coconut shell-based carbons may be a viable alternative. To find a local sales or service branch, [click here](#).