



## **COMPARING THE UNIQUE PROPERTIES OF FIBERGLASS, CARBON-FIBER AND KEVLAR, AS WELL AS THE BENEFITS OF INCORPORATING ONE OR MORE OF THESE MATERIALS INTO THE CONSTRUCTION OF YOUR COMPOSITE KAYAK**

### **Fiberglass Kayak Material (FG)**

Kayak production in fiber-reinforced plastic dates back to the 1950s. The material provides the ability to produce very fine lines, literally down to a knife-sharp entry if desired.

Fiberglass forms a lighter kayak than polyethylene (plastic). Additionally, greater stiffness and a very smooth finish enhance the glide of fiberglass kayaks. The cloth used in the construction of a fiberglass kayak is carefully selected and positioned in relation to the mechanical role it will play, resulting in a stronger craft.

Fiberglass Advantages:

- Extremely lightweight
- High strength-to-weight ratio
- Can be formed to very fine design lines
- Moderate cost

Many of our fiberglass models have optional lay-ups to suit their alternate intended usage.

We only use the highest grade materials in our manufacturing process. Each Kayak incorporates a knitted double-bias fiberglass fabric, core mat and CSM (Chopped Strand Mat) selected reinforcement in key areas to produce the finest quality kayaks available anywhere.

### **Kevlar® Kayak Material (K)**

Kevlar® offers an excellent compromise for paddlers seeking lightness and performance. Kevlar® is stronger than carbon, but lighter than fiberglass. Kevlar® is five times stronger than steel on an equal weight basis, yet at the same time, is lightweight, flexible and comfortable. It is this unique combination of attributes which enable kayak manufacturers to produce a product that is lighter weight and stronger than traditional fiberglass models. Although Kevlar® is more expensive than fiberglass, the benefits are apparent, making it well worth the investment.

General Features of KEVLAR® :

- High Tensile Strength at Low Weight
- Low Elongation to Break High Modulus (Structural Rigidity)
- Low Electrical Conductivity
- High Chemical Resistance



- Low Thermal Shrinkage
- High Toughness (Work-To-Break)
- Excellent Dimensional Stability
- High Cut Resistance
- Flame Resistant, Self-Extinguishing

### **How is a Kevlar® boat different from a fiberglass boat?**

Kevlar® kayaks are made using a sandwich of fiberglass and Kevlar® fabrics bonded together with vinylester resin. There is almost always a fiberglass cloth of some type as the outside layer(s). Because Kevlar® is much higher in stiffness and tensile strength than fiberglass, the builder can use fewer layers of cloth and in turn use much less resin reducing weight by approximately 15-20%. Kevlar® is much more expensive than fiberglass and much more difficult to repair. It can be easily recognized by its gold colour.

### **Will the Kevlar® boat be faster than the fiberglass boat?**

Not enough to be very noticeable. Unless you are an avid racer, the best reason to buy a Kevlar® kayak is the advantage of lighter weight when loading and unloading onto your car and carrying the kayak to the beach. If these reasons are not an issue, save yourself a bundle and get a fiberglass kayak. You can get some really nice accessories with your savings!

### **Will a Kevlar® boat be stronger than a fiberglass boat?**

The short answer is no! This is in part because they use substantially less material in the Kevlar® kayak to reduce the weight. However a Kevlar® kayak built with the same lay thickness as a fiberglass kayak will be substantially stronger pound for pound. Kevlar® is very high in tensile strength but relatively low in compressive strength. An all-Kevlar® boat would show initial damage fairly easily from a hard blow. The damaged cloth might stay together even though much of the resin around it will have fractured. If you expect to use your kayak in the surf zone or around rocks, Kevlar® is not a good material choice.

## **Carbon Kayak Material (C)**

Carbon-fiber offers the maximum weight reduction of all composite materials whilst maintaining the rigidity and strength required in most kayaking applications. However, carbon is not suited to all applications – it is most effectively suited to a lightweight racing layup. Carbon is quite expensive, yet if weight and performance is the issue then carbon is the choice for you.



## **How is a carbon-fiber kayak different from a fiberglass or Kevlar® boat?**

There are a few manufacturers building "carbon-fiber" kayaks. You can tell the carbon-fiber by the jet black colour resulting from the process used to make the cloth. They are almost always left visible by using a clear resin to the outside so as to display the high-tech fabric. Carbon cloth is very stiff (stiffer than Kevlar) but lower in tensile and compressive strength. The advantage to carbon is the chance to use even less material than a Kevlar® boat resulting in even less weight. These boats tend to be very costly and somewhat brittle.

## **Carbon/Kevlar® kayak material (C/K)**

Carbon-Kevlar® kayaks are constructed for high-performance, combining the extreme lightness of carbon and the elasticity of Kevlar®.

What are the characteristics of a Carbon/Kevlar® kayak?

Many kayak manufactures utilize Carbon and Kevlar® woven together. As you can guess the fabric takes advantage of properties from both materials creating a lighter weight kayak that is quite stiff although surprisingly not quite as strong as the same kayak in a fiberglass lay-up.

### **Maximizing kayak hull rigidity**

Core materials are carefully positioned in all composite kayaks to optimize their strength. Core materials such as core mat and CSM increase kayak thickness in locations most subject to stress, such as bow and stern toggles, hatch rims and the area immediately fore and aft of the cockpit. To obtain a good ratio between weight and sturdiness, a balance must be achieved between the use of core materials and fiber cloth.

### **Quality vinyl-ester resins**

The vinyl-ester resin (modified epoxy) used in the production of all composite kayaks is similar to the epoxy resins used in the aerospace industry. Besides having better mechanical properties when compared to polyester resins, its elasticity is about three times greater. Moreover, vinyl-ester resin is easier to repair.

## **Which type of kayak material will suit my needs?**

The difference between polyethylene (plastic), fiberglass, Kevlar® and carbon kayaks:

Polyethylene (plastic) kayaks are shock-resistant, low maintenance and affordable kayak. However, they can be deformed if they are not stored properly and they are heavier than composite kayaks.

- Composite kayaks can be made of fiberglass, Kevlar® or carbon.



- Fiberglass produces a lighter kayak than polyethylene (plastic). Additionally, greater stiffness and a very smooth finish enhance the glide of fiberglass kayaks.
- Kevlar® offers an excellent compromise for paddlers seeking lightness and performance. Kevlar® is stronger than carbon, but lighter than fiberglass.
- Carbon-Kevlar® kayaks are constructed for high-performance, combining the extreme lightness of carbon and the elasticity of Kevlar®.

Composite is a confusing all inclusive term used to describe kayaks made of fiberglass, Kevlar® or carbon... or any combination of the above materials. Composite kayaks are made by hand fitting layers of cloth into a gel-coated mold and then adding resin to create a stiff, tough shell using a number of processes from hand lay-ups, to high tech vacuum bagging & infusion lay-ups. The outside gel-coat adds additional protection, produces an attractive, shiny finish but most importantly enables the kayak to be relieved from the mold. Contrary to common belief fiberglass kayaks are tough and average 20-30% lighter than similar Polyethylene kayaks. Kevlar® kayaks weigh 10%-15% less again, yet offer the additional impact strength of Kevlar. Carbon offers slightly lighter craft weights again (another 5-10%). However, these kayaks must be handled with care.

You will only really know why you should buy a composite sea kayak once you own one! Composite kayaks are high performance, quality craft, custom built just for you. Once you have used one it's going to be hard to settle for anything less. Part of the attraction of owning a composite kayak is that you enter a select world of people who want the very best and are happy to spend that little more time looking after it, keeping it at its best and you will forever enjoy the superb feeling of gliding effortlessly through the water. The efficient grace, smooth lines, beautiful handling and amazing appearance of a well-built composite sea kayak really are something to behold.

There are practical reasons too, like being lighter and more rigid. This gives better efficiency through the water and the ability to customize your kayak with the many different specification options and colour choices of your deck, hull and trim.

The satisfaction you will get out of a composite kayak is not valued in monetary terms either: It will be in your own satisfaction of owning something very special that you will enjoy on your terms for many years to come.

### **Why are composite kayaks so expensive?**

The short answer is that they are a lot of work to build. The slightly longer answer is that if you want a high quality, state-of-the-art touring kayak that is lightweight and durable, then there are no shortcuts to be realized. Seaward offers a **lifetime transferable warranty**, the only such warranty of its kind on the planet. We could not offer such a high level of protection if we did not do our job and produce for you the best-built kayaks available anywhere.



**Are all Kevlar® kayaks created equal?**

No. Some of our competitors are building Kevlar® kayaks with a minimum of Kevlar® in them, expecting that the customer won't notice!! Some kayaks have as little as one single layer in the hull and are sold as Kevlar® kayaks.

Kevlar® kayaks should always have a layer of glass fiber on the outside of the laminate as Kevlar® is not very good under compression. Kayaks built with only Kevlar® will suffer compression damage on the outside of the laminate and will eventually become damaged, and so we reinforce our Kevlar® decks with unidirectional glass and the hulls with unidirectional glass and a core utilizing a twill weave Kevlar® to achieve the maximum multi-directional strength and of course the strongest possible lay-up available.

So there you go... you now have a better understand of the properties and benefits of the various materials available for kayak layup. You can now make an informed decision to best suit your needs. Should you have any additional questions, feel free to contact our office at [sales@seawardkayaks.com](mailto:sales@seawardkayaks.com).

Take care and Happy Paddling!

Researched and prepared by your friends at Seaward Kayaks.  
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