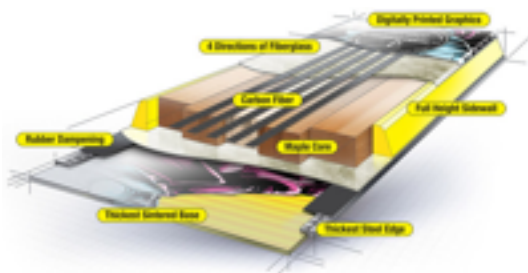


Flax Could Be A Key Material in Ski Construction

Skis are getting better and better. New shapes, wider skis, and new materials are being used in the construction of a ski. However, core construction has stayed generally the same. Traditional hardwoods such as maple, ash, birch, and spruce are usually used, but these prove to be heavy, and need multiple layers of fiberglass or an aluminum layer to stiffen the ski.

Luckily, there is a cure to this problem: flax. No, not the flax seeds found in your cereal, but flax fiber, long strands of natural fibers. Flax fibers, in a refined form for cloth, are also called linen. Flax fibers have ideal properties for ski core construction such as: dampening abilities, tensile strength, and low weight. Flax is also a very low cost material, as it is easy to grow, and ecologically sustainable. Using flax fibers in partnership with carbon fibers would enable ski cores to more effectively incorporate lighter and more beneficial woods such as balsa wood and bamboo.

First of all, flax fiber has amazing dampening characteristics. "Why is this important in a ski?" one might ask. Dampening is important in a ski because skis, when sliding over bumps and corduroy, vibrate significantly. This vibration causes loss of energy, and contact area which results in less power transmission from the skier to the snow. This means that carving, landing, and stopping will be harder on a non-dampened ski. Having a dampened ski means that the ride will be much smoother to the skier, giving the ski a longer structural life. Since flax is made from about 92% cellulose, or $(C_6H_{10}O_5)_n$, it shares some of the same properties as most wood which contains around 40% cellulose. Many woods have very good damping properties as well, however flax fibers are very lightweight, and hardwoods do not excel in dampening.



Flax fibers would replace the rubber dampening, carbon fiber, and fiberglass shown in this picture.



Woven flax fibers as shown here would sandwich a ski core to improve dampening, as well as reduce weight.

Secondly, flax fibers have a fairly high tensile strength when compared to other natural fibers. Tensile strength is the amount of force that can be tolerated when being pulled or stretched. This is because the fibers are natural polymers, or long chains of molecules. This is important in ski construction because much of a ski's core is bending while being ridden, which means there must be some reinforcement, which has in the past been most commonly fiberglass, or titanal (aluminum alloy). These materials must be able to withstand compression and tension. Both of these methods are somewhat costly, and not very ecologically responsible, compared to a natural fiber. A flax fiber weave with carbon strands in a composite would be both inexpensive, and lightweight.

Thirdly, many ski manufacturers are looking for different ways to make their ski lighter than their competitors. Skiing a light ski takes less effort, and enables longer hikes and tours in the backcountry. Many ski companies have been going the carbon fiber route, which makes the ski very light, however the skis are twice or even three times the price of a non-carbon counterpart. This is where flax fiber can play a part. Flax fibers are very lightweight, strong, and easy to obtain. Instead of going through a whole process of refining fibers, a flax fiber can be taken directly from a plant. Flax is a lightweight, cheaper alternative to a fully carbon composite ski core. The fibers can be used in conjunction with carbon strands to keep cost down, but strength even greater than a fully polymer based composite.



Flax fibers may also enable ski manufacturers to use lighter weight ski cores. Instead of traditional hardwoods, balsa and bamboo could be used as the industry standard. Balsa wood has a very low density when compared to many other hardwoods, thus the featherlight weight. Bamboo is medium density, but also is very strong and has a lively flex. The high strength of the fibers can reinforce these woods in the core, and provide the necessary pop, and flex patterns. Flax is a covalently bonded material made from cellulose chains, which make up polymers. These polymers are amorphous. This gives the fibers superior pop over other materials.

Are flax fibers the future of skiing? Given the evidence displayed, it seems to be a very good, and beneficial material to be used in skis. Skis may be more cost effective and biodegrade faster, as well as being lighter. Flax fiber could prove to be an excellent candidate for new ski construction material.

Skis using flax fiber could be lightweight, flex, and have little to no vibrations to improve power transmission.