

Bicycle body

In the current market carbon fibre and aluminium are the most popular materials for a bicycle body. Both have different properties, and both are used for different circumstances depending primarily on terrain. It is also fundamental to take into consideration new materials being developed by companies such as Innegra fibres and Dyneema. Thorough experimentation over the years has produced many innovative materials with properties that outmatch the previous.

Properties

If for instance you wanted a bike to commute to work and so on, you should be thinking about affordability and resilience, which could beat ultra-lightweight materials like carbon fibre out of the equation making aluminium favourable. On the other hand, if you are going away to the Alps and want the gentlest journey, then metals may not be at the top of your list and carbon fibre will be more favourable.

Carbon fibre is a composite material, which means it is made from several materials - carbon fibres, in a resin matrix. It is extremely strong, stiff, adaptable, and easy to repair. It is also corrosion resistant. There is a myth that carbon fibre breaks easily, and if it breaks several companies can stop the damage that costs a fraction of the price of a new body. I think in terms of technology and the efficiency of carbon fibre it is the better option.

Load

Most of the forces on a bike all work in the same direction. Therefore carbon fibre is a great material for bikes, it is very strong against forces in one direction depending on which directions the strings of fibre are woven. The frame alone must resist forces in a specific direction, that being horizontal to the ground while suppressing forces from front and rear. The disadvantage of carbon fibre is its weakness to forces from other directions, for example if it took an impact to the side of the bike (concentrated at one point) it would most likely shatter depending on the severity of the accident. That said statistics tell us carbon fibre is five times stronger than steel. Metals however are isotropic, meaning their properties are strong in all directions. A metal bike frame will be better at resisting forces acting on it in different directions which is suited to a bustling environment such as a town or city. **After analysing this information, I came to a conclusion that carbon fibre is more favourable for customers who want to push themselves in races and so on.**

Processing Methods

Carbon fibre comes in different forms: raw yarn or sheet fibre (both continuous fibre), and a short-deep fibre that can come as one sheet, or very short, long fibre clumps. Cut fibre is used in products such as pedal bodies. Sheet style is most common in bike frames: continuous sheets of carbon fibre (known as clicks), which look like bolts of fabric and usually about the same width, they are wrapped on large banks. Raw thread is much less common in the bicycle industry; only a handful of bicycle makers such as Giant and Time have the technical ability to work with raw yarn.

To mould the aluminium alloy to a bicycle frame, the metal passes through a recently devised process called hydroforming. To prepare the metal for this process, the aluminium alloy is cut into thin metal sheets and then rolled into the tubes.

The processes used on small fibre carbon are more complex than aluminium processing that is why the cost is significantly different.

Cost

Carbon is expensive. Although prices are edging down, you can buy an alloy frame with similar groups and wheels as a carbon model for much less. Carbon prices start at around £ 1,000. The expensive bikes reach prices of £10,000, the more expensive the bicycle the lighter it is. The lighter bikes are about 6-7kg, while the cheapest are about 9-10kg. Aluminium comes at much lower costs with average prices ranging from £ 100- £300. Aluminium bikes can go up to £600- £1000, but this is rare. **Most aluminium bicycles are targeted at people who want to spend a shorter sum of money to commute on tarmac on route to work. Strictly efficient performance and handling is not necessary in that instance.**

Plenty of data

There is a lot of information including tests and statistics relating to the two materials. There are several web-based websites including those that compare carbon fibre and aluminium. Weight for weight, carbon fibre offers 2 to 5 times more rigidity (depending on the fibre used) than aluminium. In the case of certain components that will be stressed only along one direction, made of carbon fiber, its stiffness will be 5-10 times more than aluminium (of the same weight).

Availability

Over the years carbon fibre supply and demand has gone up and down, this is due to economic reasons. Investors have been likely to increase supply when demand causes rise in prices. The instability has created a lot of frustration over the years. Occasionally since 1990, prices for standard 12k/24k fiber have varied between \$12-40/kg (\$ 5.50-18 / lb) in a 12-15 month period.

In order for the industry to move forward and expand it is necessary to reduce large variations in unit availability and stabilize prices. In fact, there are positive signs that the carbon fibre manufacturing industry is starting a period of stability. Most carbon fibre producers, up-and-coming and large, are now running major expansion programs and aircraft manufacturers (Boeing and Airbus) are now more confident about the future, with positive book bookings for the next five to ten years.

In researching through several companies and websites I discovered that currently the aluminium industry is in decline with increased consumption but decreasing supply. This is due to depression in countries such as Italy and Spain, which are major producers in the industry. In conclusion it seems carbon fibre is in a better position for the future compared to Aluminium.

Environment

When studying the properties of Carbon Fibre it can see it almost perfect for challenging land.

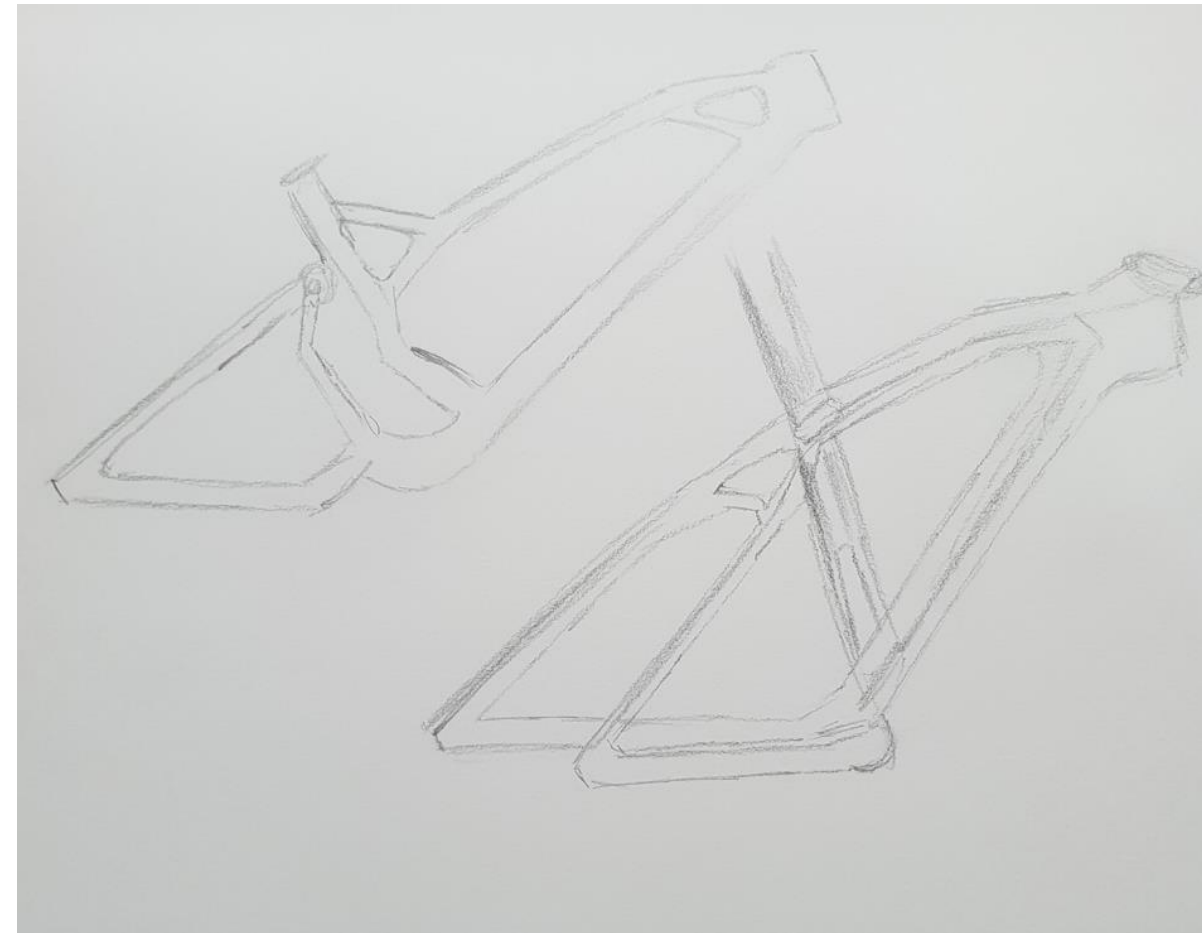
1. High Strength to weight ratio
2. Fatigue Resistance
3. Rigidity
4. Corrosion resistance
5. Good tensile strength but Brittle
6. Electrical Conductivity
7. Fire Resistance
8. High Thermal Conductivity in some forms
9. Low coefficient of thermal expansion
10. Requires specialized experience and equipment to use.

11. X-Ray Permeable
12. Non poisonous
13. Biologically inert
14. Relatively Expensive

Part	Material	Contruaction
Frame	Innegra	Innegra can be woven alone, with fiberglass, carbon or other fibers to produce other composites.
Frame	Carbon Fibre	Using a similar process to innegra carbon fibre is also woven
Frame	Aluminium	Alumunium is cut into thin sheets to be pu through a process of hydroforming

Experimenting with frame Dimensions

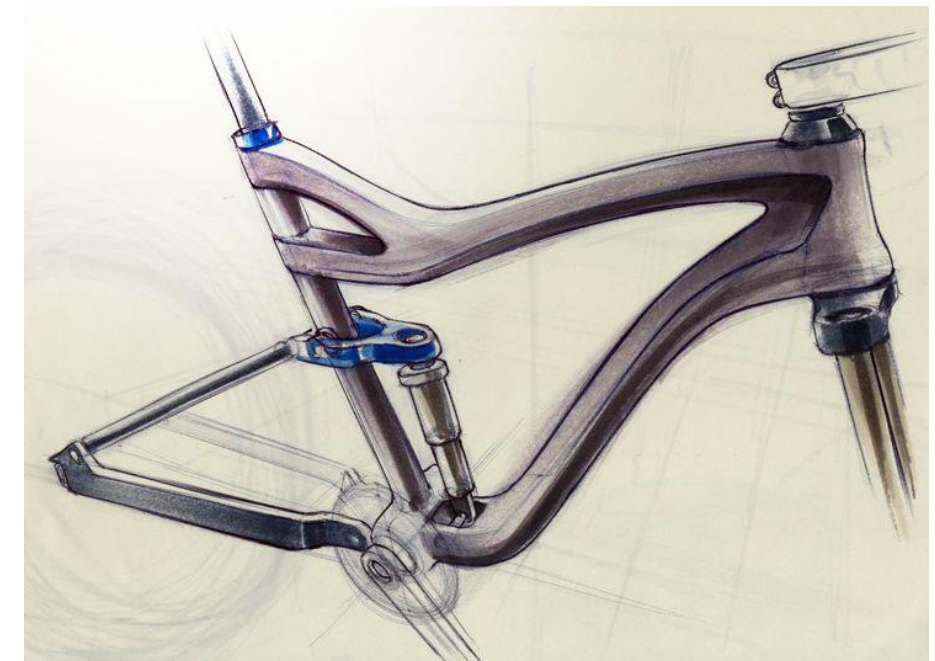
Dyneema



Carbon Fibre



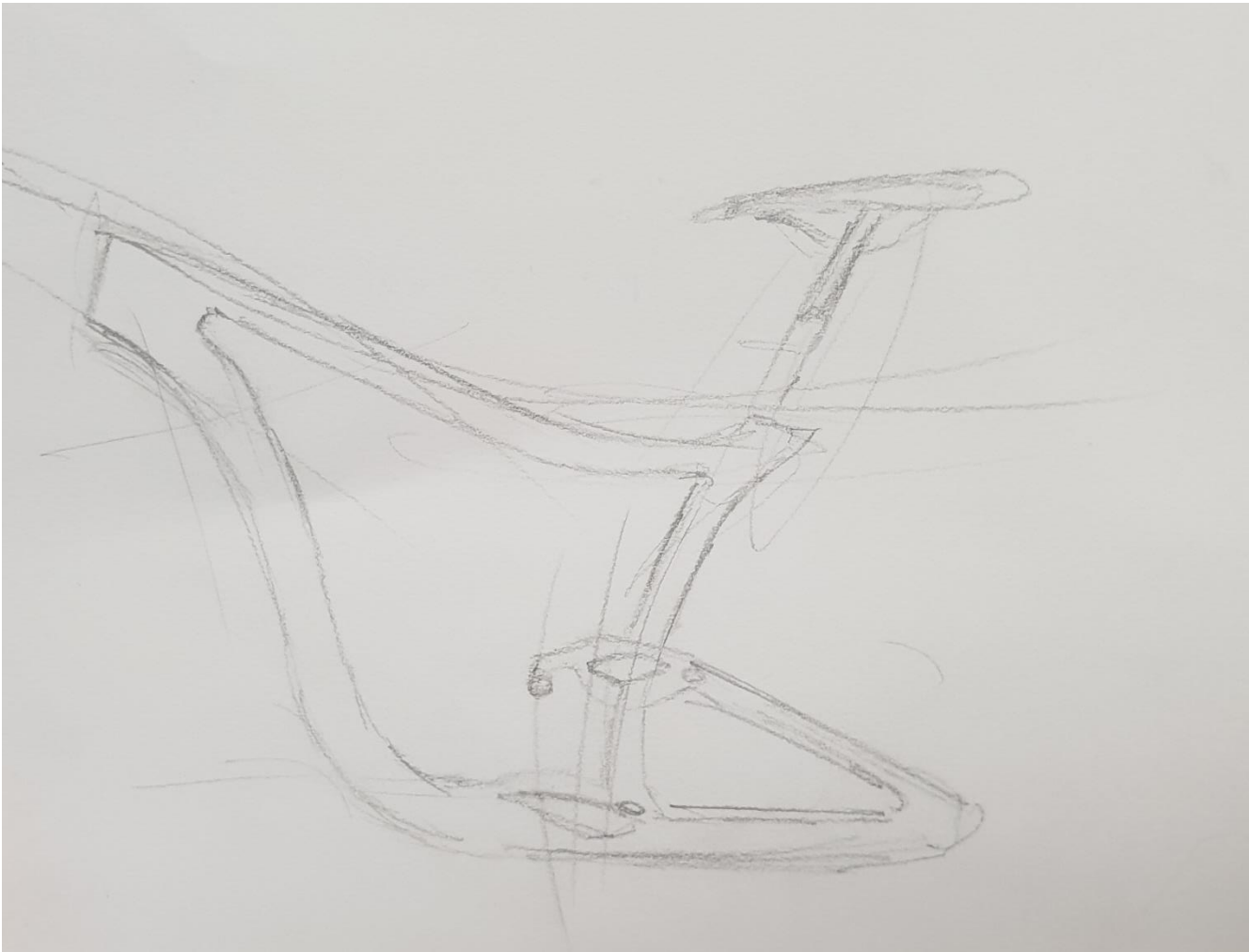
Innegra



Dual suspension mountain bike frame



Old



New

