1. Astroquartz:

Astroquartz is manufactured by the company JBS glass. It is made from silica fibers and can be combined with multiple matrixes which include Epoxy, Polyimide, and different kinds of thermoplastics to obtain different properties. Astroquartz is composite that is primarily used by the aerospace community for high heat and high strength capabilities while having densities that measure around 7 ounces per square yard. Depending on which style of Astroquartz that is purchased one can have a tensile strength at 350°F of 635 MPa to 64MPa. There is a form of Astroquartz that has a tensile strength of 1.0 GPa after being subject to boiling temperatures for 2 hours. The properties of the composite vary greatly depending on the weave and epoxy used in manufacturing.

2. Tempmat:

Tempmat is manufactured by the company JBS glass. It is made of E-glass fibers that are manufactured into a web form. The material is often used in oil refineries, steam and gas turbines, and exhaust systems due its insulating properties and strength retaining capabilities at temperatures up to 1200°F. This material has a density of 9 lbs/cft. The “K” values for the material range from 0.40 at 300°F to 0.65 at 700°F. The manufacturer does not supply information on what kinds of matrix are used in this composite.

(1)<http://jpsglass.net/wp-content/uploads/2015/08/docslide.us_jpsdatabook-55845c9747baf.pdf>

Reference for both 1 and 2

3. Carbon-Carbon Composites

Carbon-Carbon composites are a class of composites that are made of a carbon lattice, and a carbon matrix. Carbon-Carbon composites are made of carbon fibers with a matrix that is also made of carbon. The matrix is deposited onto the fibers by vapor deposition or deposited with a thermosetting liquid. They are described as being “ceramic in nature, but exhibit brittle to pseudo plastic behavior” (2). They have “excellent thermos-structural properties” (2) which means that it has applications in high heat environments such as rocket nozzles, nose cones, and in brakes. For an idea of the price of Carbon-Carbon composites a set of 2 brake disks costs almost $2500 (3) while a conventional set costs less than $100.

(2) <http://publications.drdo.gov.in/ojs/index.php/dsj/article/viewFile/4291/2504>

(3) <https://www.carid.com/wilwood/carbon-ceramic-rotor.html?gclid=Cj0KCQjwz93cBRCrARIsAEFbWsgOuE7_ZK_7gKc80kzniX5KFP3IYSILiTrdDg-hNflnqs1_PxgO64kaAkgyEALw_wcB>

4. Fiberglass

Fiberglass is a family of composites that is made of glass fibers and a wide range of matrixes, usually epoxy or thermosetting plastic such as polyester. Many fiberglass items are coated in a gel coat to protect the fiberglass from water damage. Fiberglass has a few major classifications such as A-glass, C-glass, E-glass, AE-glass and S-glass (4). The most common forms of fiberglass being E-glass and S-glass. E-glass is used for electrical insulation in items such as rods for electric fences, and S-glass is used for its structural strength and is commonly used in items such as bathtubs, storage tanks and boats.

(4) <https://www.phelpsgaskets.com/blog/fiberglass--types-properties-and-applications-across-industries>

5. Carbon Fiber

Carbon fiber composites are made of carbon fibers and a matrix made of epoxy or a thermosetting plastic. Carbon fiber is reputed for being twice as stiff as steel at one fifth the weight, making it an ideal material for manufacturing (5). Carbon fiber, like many other composites, is temperature tolerant and has a low coefficient of thermal expansion. The carbon fibers are made by heating fibers to a very high heat without oxygen to turn them into pure carbon, they are then woven or left unidirectional. Carbon fiber composites can be used in the place of many conventional materials such as steel if the increase in price can be justified. A four pound spool of carbon fiber is priced at roughly $45 (6) while a two pound length of steel is priced at just over $4 (7).

(5) <http://www.innovativecomposite.com/what-is-carbon-fiber/>

(6) <http://shop.fiberglasssupply.com/Carbon_and_Kevlar_Fabric-6K_Carbon_Tow_Full_Roll.html?_vsrefdom=adwords&gclid=Cj0KCQjwz93cBRCrARIsAEFbWsih7sWF4yANc95AC-66h-UF_Iy8h_MzLWJw2ArmI-kKGZEFZ4-_2yQaAqtAEALw_wcB>

(7) <https://www.onlinemetals.com/merchant.cfm?pid=10280&step=4&id=844&CAWELAID=120293320000041530&CATARGETID=120293320000072935&cadevice=c&gclid=Cj0KCQjwz93cBRCrARIsAEFbWsgKMWPcNjM7r0remIvGQFTz8IVbLYFu2YUXt1_RmyCmKZJfUIaMkRYaAsj2EALw_wcB>