**2- Fiber and Textile Fabrication:**

The textile industry is very old and many technologies have been developed for processing woven or non-woven fabrics. Textile techniques have been adopted for the fabrication of tissue engineering scaffolds. For example, fibrous scaf­folds have been created for engineering cartilage, tendons, bone, heart valves, blood vessels, nerves, and so on. Examples of fiber and textile fabrication techniques include fiber bonding and fused deposition modeling.

**Fiber Bonding:**

One big advantage of using fibers is that they provide a very large usable surface area, which is desirable for scaffold applications because it provides more surfaces for cells to attach to. By simply piling the fibers together, three-dimensional scaffolds can be obtained. However, the scaffolds constructed using this method lack structural stability. To improve the stability, the fiber bonding technique may be used. This technique involves use of a binder, or, by using the ther­mal method to fuse the fibers together.

**Rapid Prototyping Textiles: Fused Deposition Modeling:**

Rapid prototyping ( RP) can be used not only with polymers, but with textiles as well, with the typical example being fused deposition modeling. In brief, fibers are extruded from the head of a thermal extruder in a semi-liquid state, directed precisely to the desired position, and fused with other fibers during a solidifica­tion process. A computer-controlled platform with accurate X, Y, and Z move­ment.

**3- Inorganic Scaffold Fabrication:**

Porous bioceramics, such as hydroxyapatite ( HA ) , tricalcium phosphate ( TCP) , and Bioglass , have been developed for hard tissue implants and tis­sue engineering scaffolds, owing to their excellent material properties. These properties include excellent biocompatibility and bioactivity, bioresorption in calcified tissue, macroporosity, which facilitates cell and tissue ingrowth, as well as nutrient and waste product transport and vascularization. There are basically two routes to fabricate three-dimensional biominerals scaffolds, which vary according to the temperature applied.

**The High Temperature Route:**

The high temperature route is adopted from a traditional ceramic process­ing technique. This route for fabricating highly porous bioceramic scaffold con­sists of four steps. The first step is mixing the bioceramic raw powders with polymeric fillers. The polymeric fillers must be burned out completely in order to leave behind only non-toxic gases. The appropriate amount, size, and shape of the polymeric fillers determine the three-dimensional architecture, macro­structure, and microstructure of the scaffolds. The second step is compressing the mixture under pressure into the desired shape. The third step is burning of the polymer at a certain temperature for a particular time period. The final step is sintering the ceramic powder into a porous solid form. Through this high temperature route, scaffolds with a porosity of up to 70% can be obtained. However, the biggest problem with this method is that with increasing porosity, the mechanical properties of the scaffold decrease dramatically. By combining this method with hot isostatic processing ( HIP) and nanotechnolo­gy, the mechanical properties of the porous ceramic scaffolds may be improved to some extent. Even with these modifications, porous bioceramics are gener­ally still not strong enough for load-bearing situations, owing to their brittle na­ture.

**The Low Temperature Route:**

Using the high temperature route, only macroporous ceramic scaffolds can be fabricated. However, Walsh developed a process called the bicontinuous microemulsion technique or crystal tectonics, which allows for the fabrication of porous scaffolds that are either mesoporous or macroporous. This technique is based upon the immiscibility phenomenon of emulsion similar to that used in emulsion freeze-drying techniques. Briefly, the scaffolds can be formed from oil-water-surfactant microemulsions supersaturated with biominerals. The pore size and structure are determined by the relative concentrations of water and oil. Such complex, three-dimensional ar­chitectures with either mesoporous or macroporous structures may be utilized as scaffolds for tissue engineering organs, such as bone, as well as for other im­portant applications such as lightweight ceramics, catalyst supports, biomedical implants, and robust membranes for high temperature separation technology.