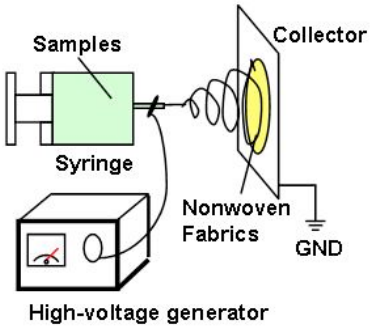
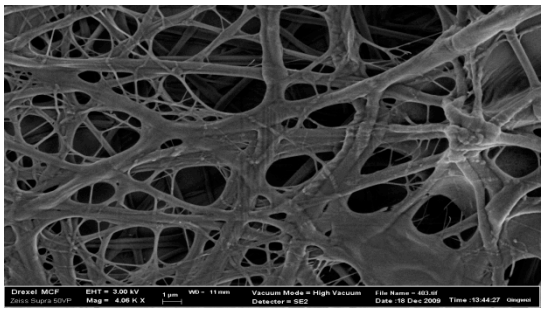
**Mike Frohbergh**




*A basic schematic depicting an electrospinning setup*

Briefly, electrospinning is a technique that has become very appealing to fabricate biomimmetic scaffolds over the past decade because of its ability to create fibers that resemble the natural extracellular matrix (ECM) of tissues in the body. A solution containing a specific polymer is loaded into a syringe and extruded at a constant rate by a syringe pump. The positive lead of a high voltage generator is connected to the needle tip while the negative lead is connected to a collector set at a given distance from the needle. As the solution passes through the needle, the solvent is evaporated off and the polymer fibers are pulled through the electric field generated and collected either as a flat mat or a specified template.

The two main properties focused at with these scaffolds are mechanical properties and obtaining the biphasic property found in natural bone. A one-step process to obtain mineralized fibers containing chitosan and hydroxyapatite is employed, followed by a second step where the fiber mats are crosslinked with genipin, a natural chemical crosslinker derived from gardenia fruit extracts. The function of the crosslinking is to increase the mechanical strength of the mats to mimic the natural strength of bone, namely a Young's modulus of ~0.5GPa for cancellous bone.



*Electrospun chitosan fibers crosslinked with 0.01% genipin and mineralized with 0.4% hydroxyapatite*

Further studies to be conducted will involve seeding the scaffolds with mesenchymal stem cells to see if the enhance, or even induce osteogenic differentiation. One of the biggest problems with regenerative medicine is cell sourcing, so the use of mesenchymal stem cells in this instance could help to relinquish this problem. Once optimized, the scaffolds will be studied *in vivo* by implanting into animal models to see if they can induce natural bone tissue to begin to self regenerate.