Nano-Fiber Fabrication Facility

Introduction

With the emergence of nanotechnology, exploring the unique properties of nanoscale materials is the recent trends for researchers. Electrospinning is a versatile and efficient fabrication method for one-dimensional (1D) nanostructured fibers of metals, metal oxides, hydrocarbons, composites, and so forth. The resulting nanofibers (NFs) with controllable diameters ranging from nanometer to micrometer scale possess unique properties such as a high surface-area-to-volume and aspect ratio, low density, and high pore volume. These properties make 1D nanomaterials more advantageous than conventional materials in energy harvesting, conversion, and storage devices, in tissue engineering, biosensors, filtration, wound dressings, drug delivery, and enzyme immobilization. Electrospinning has the ability to manipulate nanofiber composition in order to get desired properties and function. Over the years, more than 200 polymers have been electropun for various applications and the number is still increasing gradually with time. With these in perspectives, CSIO indigenously designed and developed a table top electrospinning machine, enable to fabricate polymer based metallic nanofiber composite.

The machine consists of a spinneret (volume of 50 ml) with five syringe needles (nozzle diameter of 0.5 mm), high-voltage power supply (0–30 kV, 100 mA), rotating drum wrapped with aluminum foil for collecting the fiber both in – on substrate mode and off-substrate mode, servo motor (0–500 rpm), and a small pump to regulate the sample flow rate of10 μl/min, and adjustable linear stage to vary the distance between the nozzle and the collector. Currently, CSIO is working with the fabrication of GMR sensor materials using ferromagnetic materials for clinical diagnostic applications as well as for heavy element detection in water.