Rancang bangun pengendali syringe pump dan high voltage power supply untuk Electrospinning Berbasis Mikrokontroler = Design and control of syringe pump and high voltage power supply for Microcontroller-based Electrospinning

Muhammad Febrizky Akbar, author

Abstrak

Telah dibangun sistem pengendali syringe pump dengan rentang debit 3.2 mLh-202.35 mLh dan high voltage power supply dengan rentang tegangan 0-30 kV untuk sistem electrospinning. Sistem penggerak piston syringe menggunakan linear actuator yang dibangun dari ball screw 1510 dengan penggerak stepper motor. Untuk meningkatkan daya dorong piston syringe, kecepatan stepper motor direduksi dengan gearbox rasio 100:1. Pengaturan debit setiap syringe pump diatur dengan pulsa clock yang diberikan ke driver motor yang frekuensinya dapat diatur dengan persamaan frekuensi versus debit sebesar y=3.9815e^(-5) x-0.0026712. Modul tegangan tinggi AHV24V30KV1MAW dari Analog Technologies membutuhkan suplai tegangan 24 V/2 A yang dapat mengeluarkan output 0-30 kV proporsional dengan input tegangan control 0-5 V. Sistem pengendalian tegangan tinggi digunakan dua metode yaitu metode otomatis dan manual. Tegangan tinggi dan syringe pump digunakan untuk menghasilkan nanofiber menggunakan larutan polimer polyvinyl alcohol (PVA) 15wt%. Proses pengeluaran PVA dengan debit 3.2 mL/h dan tegangan tinggi minimal 10 kV dapat menghasilkan taylor cone dan tumpukan serat di collector.

.....A syringe pump control system has been built with a flow rate range of 3.2-202.35 mL/h and a high voltage power supply with a voltage range of 0-30 kV for electrospinning system. Piston of the syringe is driven by a linear actuator built from a 1510 ball screw connected by a stepper motor. To increase the thrust of the syringe piston, the speed of the stepper motor is reduced by a 100:1 ratio gearbox. The flow rate setting of each syringe pump is regulated by clock pulses given to the motor driver whose frequency can be adjusted by the equation of frequency versus discharge of y=3.9815e^(-5) x-0.0026712. The high-voltage module AHV24V30KV1MAW from Analog Technologies requires a 24 V/2 A supply voltage that can output 0-30 kV proportional to the 0 -5 V control voltage input. The high-voltage control system uses two methods, namely automatic and manual methods. High voltage and a syringe pump were used to produce nanofibers using a 15wt% polyvinyl alcohol (PVA) polymer solution. PVA solution is discharged from the syringe with a flow rate of 3.2 mL/h and a high voltage at least 10 kV can produce Taylor cones and piles of fiber in the collector.