

Annexure A

Design and development of dip coating system

Sol-gel based dip coating is a promising technique for thin-film coating compared to vacuum deposition techniques. The method is environmentally friendly, and the coated films exhibit excellent adhesion. Further, it offers the potential to cover large arbitrary surfaces and different substrates (metal, glass, etc.) [Brinker & Scherer, 2013, Kickelbick, 2007]. Due to these advantages, we have developed a small dip coating system in IIT Jodhpur for the development of spectrally selective coating surfaces to show large-scale viability.

A.1 Procurement and assembly of component

An Arduino BT, a microcontroller board based on ATmega168, supplied with 328 and the Bluegiga WT11 Bluetooth module (<https://www.arduino.cc/en/Main/ArduinoBoardBT?from=Main.ArduinoBoardBluetooth>) was issued from electronics lab, IIT Jodhpur. The operating voltage for the microcontroller is 5V. Rhino made micro-stepping motor driver (RMCS-1106) of 40V DC and 2A rating and NEMA23 10kgcm stepper motor with pulley, which can operate at 3.3 V and 2 A current, were purchased from ROBOKITS. A 5 V DC supply was also purchased for power supply. The microcontroller is programed by enabling bluetooth for upward and downward motion. The two tuner knobs are connected to control the upward and downward speed. The microcontroller, micro-stepping motor driver, and stepper motor are electrically connected, as shown in **Figure A.1**. A mechanical structure of base 0.3*0.3 m² and 1.2 m high was made using an iron plate with the help of mechanical workshop at IIT Jodhpur. A pulley and thread arrangement was made for holding the substrate. The schematic of the assembled dip coating system is shown in **Figure A.2**.

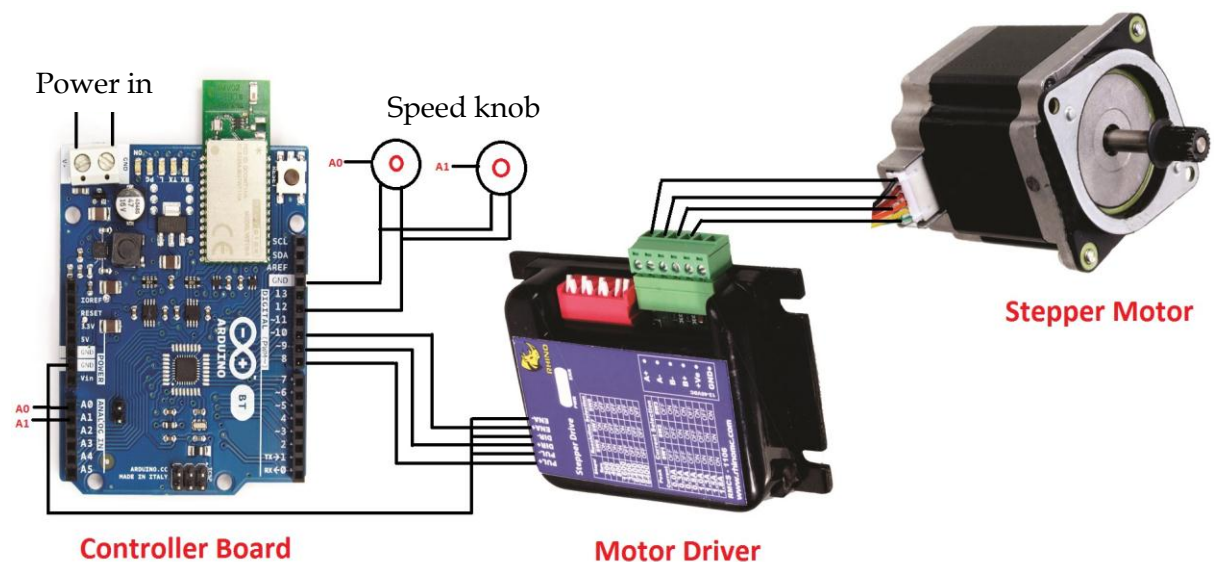
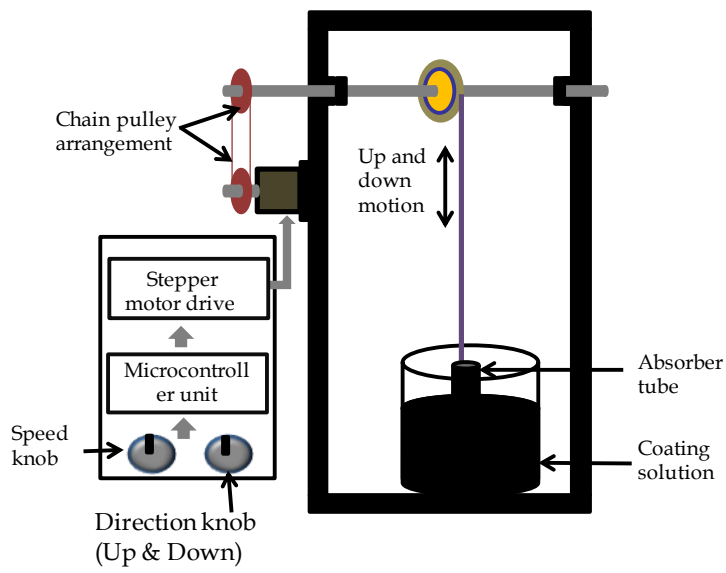


Figure A.1 Electrically connected controller, micro-stepping motor driver, and stepper motor



(a)



(b)

Figure A.2 (a) Schematic image of assembled dip coating system (b) Actual image of dip coating system made at IIT Jodhpur