ABSTRACT

In this study, we have built an instrument for controlling the input current to thermoelectric cooler (TEC) by using PID control. For cooling process, we use thermoelectric type of 12706 with active material of Bi_2Te_3. The instrument has been tested by comparing the cooling process with and without PID control. Without PID control the TEC modules cools the temperature down to 11℃ within 6538 seconds. This temperature is obtained within 2060 seconds when PID control is applied. This finding shows that PID control can accelerate three times faster the achievement of temperature stability. The best parameters for controlling are K_p =8.59, K_i =1.9 and K_d =0.475. In Addition, we observe two serial modules of TEC with current input of 2A can also reach a set point of 11℃ which is equal to the cooling process using three individual TEC modules and which is driven by 6A current. This result shows that beside the number of TEC modules, the heat distribution also plays important role in cooling process. Since two serial modules dissipate less power than three individual modules, the heat distribution becomes more effective and similar temperature can be achieved.

Keywords: Thermoelectric, TEC, Temperature, PID.