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Automation of alumina nanopore fabrication by anodization¹ LEONARDO A. BELLO PUENTES, IGOR V. ROSHCHIN, PAVEL LAPA, Department of Physics and Astronomy, Texas A&M University — To fabricate arrays of nanopores, we use anodization of aluminum films. This process requires monitoring of current, voltage and temperature. We designed a control system that uses Labview, a data acquisition card (DAQ) with a built-in analog-to-digital converter (ADC), and amplification circuits. One of the challenges is to measure a broad dynamic range of current from 1 mA to 10 A. The resolution of our 12-bit ADC, which is inexpensive and commonly used with Labview, does not allow measuring 4 decades of current directly. We implement an amplifier that automatically switches between three ranges of measured currents. The response of the operational amplifier is not linear in the entire range of input voltages, and we establish the linear region of amplification for this operational amplifier chip, with the intention of resolving 1 mA current at the smallest range. Using this linear range, we establish the limits for the three ranges of the measured current and configure the auto-ranging that is controlled by a finite state machine (FSM) implemented in Labview. Since the thickness of the anodized material is proportional to the total charge passed through the sample, the system can stop the anodization process for a preset thickness of the material.

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