Research Article

Simulation of Neuronal Membrane Behavior Based on Graphene Oxide Memristor

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Abstract

Computing and neuromorphic engineering areas have gained notoriety over the past few years. The current paradigm of computing, based on a centralized system, is an obstacle to evolution. It is necessary to leave Von Neumann's paradigm behind and invest in a more organic and decentralized model of technology. Neuromorphic computers are not made with transistors, but with memristors, electronic components are capable of retaining memory. In this study, the aim is to analyze the behavior of a memristor based on graphene oxide (GO) doped with silver simulating the neuronal membrane and validate the operation of the resistor–capacitor (RC) circuit as a possible tool for analysis of memristor devices. Electrical analyses are carried out in two stages: first, an I ×

V analysis of device parameters is carried out with a picoammeter; then, a test with a developed RC circuit is carried out in three conditions: a simulated RC circuit, an experimental analysis of the same circuit, and finally, the RC circuit is associated with the memristor. Memristor device presents threshold switching, which is a desirable feature when it is required to simulate neuronal firing. In addition, when associated with the RC circuit, the curve behavior obtained for charging and discharging the capacitor becomes nonlinear.

Conflict of Interest

The authors declare no conflict of interest.

Open Research ⌄

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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