World Academy of Science, Engineering and Technology
International Journal of Physical and Mathematical Sciences
Vol:17, No:10, 2023

A TiO_2-Based Memristor Reliable for Neuromorphic Computing

Authors : X. S. Wu, H. Jia, P. H. Qian, Z. Zhang, H. L. Cai, F. M. Zhang

Abstract : A bipolar resistance switching behaviour is detected for a Ti/TiO2-x/Au memristor device, which is fabricated by a masked designed magnetic sputtering. The current dependence of voltage indicates the curve changes slowly and continuously. When voltage pulses are applied to the device, the set and reset processes maintains linearity, which is used to simulate the synapses. We argue that the conduction mechanism of the device is from the oxygen vacancy channel model, and the resistance of the device change slowly due to the reaction between the titanium electrode and the intermediate layer and the existence of a large number of oxygen vacancies in the intermediate layer. Then, Hopfield neural network is constructed to simulate the behaviour of neural network in image processing, and the accuracy rate is more than 98%. This shows that titanium dioxide memristor has a broad application prospect in high performance neural network simulation.

Keywords : memristor fabrication, neuromorphic computing, bionic synaptic application, TiO_2-based
Conference Title : ICP 2023 : International Conference on Physics
Conference Location : Los Angeles, United States
Conference Dates : October 30-31, 2023