

Reconfigurable halide perovskite nanocrystal memristors for neuromorphic computing

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Computing

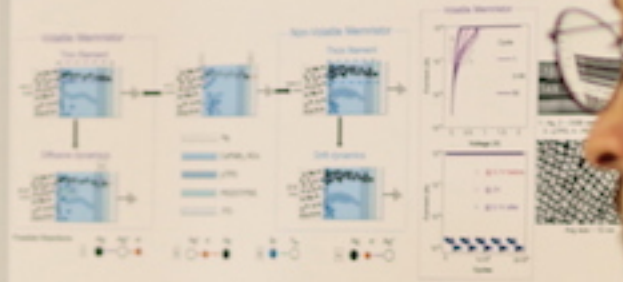
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Technology

with Icc modulation

Reconfigurable halide perovskite memristors

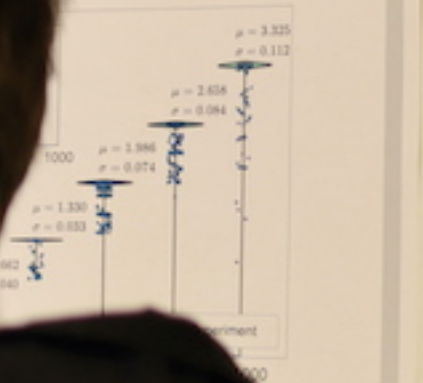


The proposed device structure comprises ITO (100 nm), PEDOT:PSS (20 nm), polyTPD (20 nm), OGB-capped C₆PbBr₃ NCs (20 nm) and Ag (10 nm).
• Diffusive mode operation 0V → 2V → 0V with I_{CC} = 1 μA
• Drift mode operation 0V → +5V → 0V → -7V → 0V with I_{CC} = 1 mA

Fully-memristive reservoir computing



• Volatile (diffusion-based) behaviour is used to store information
• Non-volatile (drift-based) behaviour is used to store information
• The reservoir network is trained on the network
Reconfigurable switching between volatile and non-volatile behaviour enables multiple-bit linear non-volatile programming of the memristors for the purposes of the reservoir computing on the network.

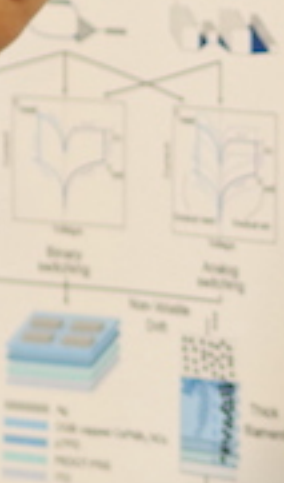


Introduction

Different neural computing architectures require different memristor switching characteristics.

- Volatile memristors are used as synaptic weights to process the input signals. Best represented by volatile memristors.
- Non-volatile memristors are used as synaptic weights to process the input signals. Best represented by non-volatile memristors.
- Memristors that can be programmed both volatile and non-volatile (volatile and slightly non-volatile) can be used as synaptic weights in neuromorphic computing devices.
- Memristors that can be programmed both volatile and non-volatile (volatile and slightly non-volatile) can be used as synaptic weights in neuromorphic computing devices. Specifically benefits from the ability to store information for a long time during the training phase.

Artificial Neural Networks



We present a reconfigurable halide perovskite nanocrystal memristor that enables bidirectional switching between diffusive and drift mode by controlling electrochemical reaction.