Ionic Memristors for Efficient Neuromorphic Computing Systems

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Nanoscale memristive systems are emerging as an alternative platform to conventional silicon transistors for energy-efficient hardware implementation of neuromorphic computing. The memristor (ionic memristor) is referred to as the forth circuit element which the resistance can be changed gradually by the electric pulse signals that have been applied to it [1]. Moreover, the stored resistance state in a memristor is non-volatile and their large on/off ratio with analog resistive memory characteristic make this system appealing as a circuit element for neuromorphic computing device. Their gradual resistance change characteristics induced by ion-migration depends on the magnitude, duration, and number of programming pulses with the resulting synaptic response mimicking the synaptic function of biological neurons. However, the stochastic nature of defect-induced switching coupled with limited control over intrinsic materials defects have been identified as the primary factors undermining the reliability of memristors in scaled crossbar-array architecture.

In this talk, I will address technical issues of ionic memristors and introduce promising candidates as memtransistors [2,3] and alkali-ion memristors [4] for neuromorphic computing systems.

References

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