SEMINAR PROGRAM

DEPARTMENT OF CHEMISTRY & BIOCHEMISTRY
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We Are Pleased to Announce a Seminar
Presented By

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University of Oklahoma
Department of Physics and Astronomy
CQRT

Friday, October 14, 2022
4:15 pm
National Weather Center
Room 1313

Robust Memristors for AI/ML Applications

We are now living in exciting/anxious times where AI/ML is supposed to literally take over most human operations including decision making. However, the implementation of AI/ML is still dependent on CMOS based circuits which are highly energy intensive. Currently, there is a concern that unless the energy consumption of circuits designed for AI/ML operations is brought down by several orders of magnitude the progress in AI/ML is likely to be hampered. One of the drawbacks of current CMOS circuitry is the von Neumann bottleneck (VNB) whereby the separation of the CPU from the memory results in a significant energy loss just in shuttling data between the memory and CPU. Hence even if the CPU is efficient, the VNB creates energy loss and delay. To get around this problem, modern approaches are replicating some of the way a neuron functions and one of the important attributes is in-memory computing, where the same devices houses both memory and switching functions. Memristors are non-volatile memories with different conductivity states and hence replicate neurons to some extent. In my group we have explored various material systems and device concepts to make energy efficient memristors. In my talk I will discuss two material approaches- oxide and organic based.

All the memristors are basically capacitor-like structures, where the conductivity between the electrodes is voltage dependent. With oxides, we have explored three approaches to memristors based on oxygen vacancy migration, band filling effects and ferroelectric tunneling. The organic devices are based on an azo aromatic complex where the switching occurs due to changes in the redox states of the molecules with voltage. My talk will discuss the progress in both these approaches, and I will also discuss my plans for future research at CQRT.

(Biography on back)

Refreshments will be served at 4:00 pm

REMINDER ~ WEAR YOUR I.D.

T. Venkatesan- A Short Biography

Prof. T. Venkatesan is currently the Director of the Center for Quantum Research and Technology (Professor of Physics and ECE) at University of Oklahoma (OU), and Scientific affiliate at NIST Gaithersburg. He is also the founding Director of the Center of Optimal Materials for Emerging Technologies (COMET) at OU. Prior to this he was Director of the Nano Institute at the National University of Singapore (NUSNNI) where he was a Professor of ECE, Physics, MSE and NGS. He wore various hats at Bell Labs and Bellcore before becoming a Professor at University of Maryland. As the inventor of the pulsed laser deposition (PLD) process, he has over 800 papers and 34 patents and is globally among the top one hundred physicists (ranked at 66 in 2000) in terms of his citations (Over 53,000 with a hirsch Index of 116-Google Scholar). He has graduated over 56 PhDs, 35 Post Docs and over 35 undergraduates. He is also the founder and Chairman of Neocera, and Neocera Magma, companies specializing in PLD and magnetic field imaging