

Title of the talk: **Atomic Layer Deposition: from materials to applications**

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Abstract:

Atomic Layer Deposition (ALD) offers possibility of achieving atomically thin films of materials, adding significant contribution to the scaling down of device dimensions for various technology nodes. This talk describes mainly two technologies where ALD could play crucial roles: firstly, the deposition of very thin dielectric high-k materials for high-density capacitor applications and thin film transistors, and secondly, the scaling effects in Resistive Random Access Memory (RRAM) technology. Though ALD is a low-temperature process compared to normal chemical vapor deposition (CVD), the thermodynamics of its film growth mechanism can cause phase segregations when ternary oxides are deposited. This aspect is examined using $\text{La}_x\text{Zr}_{1-x}\text{O}_y$ as an example. This phase segregation is found to enhance the performance of high-k dielectrics, achieving dielectric strengths larger than the empirical maximum value. On the other hand, the thickness scaling limits in RRAM technology could be studied using ultra-thin ZnO films deposited using ALD. ZnO thin films as thin as 1 nm could be deposited using ALD, and the performance of the device is observed to be limited by electron tunneling through the layer.

A short CV of the speaker:

Dr. K.B. Jinesh is working as an Assistant Professor at the Department of Physics, Indian Institute of Space-Science and Technology (IIST), Trivandrum, Kerala. He has obtained two PhD's, first in Physics from Kamerlingh Onnes Laboratory, University of Leiden, The Netherlands, and the second in Electrical Engineering, from Department of Electrical Engineering and Computer Science, University of Twente, The Netherlands. After PhD from Leiden, he worked as a scientist in Philips Research (Netherlands), working on the integration of passive elements in Integrated Circuits. For this work, he received the "Innovation Starts With You" award of NXP Semiconductors. Later, he worked as a scientist in Holst Center (IMEC, Netherlands). Then he joined as a Senior Researcher at Nanyang Technological University (NTU) in Singapore before joining in IIST in 2013. Currently his research interests are in Resistive Random Access Memory (RRAM) device technology and 2-dimensional materials for electronic applications. He has published about 50 international journal articles and 12 patents.