

SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING
Website: <https://cde.nus.edu.sg/ece>

Area: Microelectronic Technologies & Devices

Host: Dr. Evgeny Zamburg

TOPIC	:	HfOx based RRAM Endurance Improvement with Oxygen Plasma Treatment
SPEAKER	:	Mr. Yan Jianghu Graduate Student, ECE Dept, NUS
DATE	:	Friday, 22 July 2022
TIME	:	10.00AM to 10.30AM
WEBINAR	:	Join Zoom Meeting https://nus-sg.zoom.us/j/84984456511?pwd=L2JoVEYxK2E4TWlxVFZqc2M5U3lzdz09 Meeting ID: 849 8445 6511 Passcode: 570038

ABSTRACT

RRAM, as emerging memories, has attracted tremendous attention, especially in neuromorphic computing network, attributed to its scalability, high density, high speed, low cost, low power consumption. However, the resistance variability remains a major challenge and the failure mechanism of the reliability is also not fully understood, which slow down the RRAM to be commercialized. Therefore, the motivation of this study is to find an approach to improve the RRAM reliability performance and explore a novel way to understand the performance gain. This presentation will focus on a systematic study on RRAM endurance improvement. Firstly, I'll touch base of RRAM structure, classification and working mechanism. Secondly, a fabrication process of HfOx based RRAM device will be introduced. Thirdly, DOE of oxygen plasma treatment and electrical characteristic will be discussed. To understand the mechanism of the lower forming voltage and better endurance of O2 plasma, then Hf_x film characterization is performed by XPS and C-AFM. which revealed a competition between oxygen vacancies generation and oxygen ion generation by the O2 plasma treatment. because oxygen ion bombardment breaks up the Hf-O bond, creates more oxygen vacancies. Meanwhile, oxygen ions incorporate in the interstitial sites (non-lattice). 3min split reaches the saturation point, both oxygen ions and vacancies achieve maximum concentration, which well explains the best window margin and endurance performance result. This study sheds a light for the further improvement of RRAM performance and eventually to deliver a RRAM system application in neuromorphic computing in future.

BIOGRAPHY

Yan Jianghu is currently working towards his MEng degree in the Electrical and Computer Engineering Department at the National University of Singapore. His research interests include emerging memory devices, such as RRAM, MRAM etc. fabrication process and performance optimization as well as neuromorphic computing with the emerging memories.

<https://cde.nus.edu.sg/ece/highlights/events/>