

## **GaAs and Graphene Based Materials for Electronic Applications.**

Dr. Sk. Masiul Islam

Senior Scientist, Semiconductor Device Design

CSIR-Central Electronics Engineering Research Institute (CSIR-CEERI),

Ministry of Science & Technology, Govt. of India

Assistant Professor, Academy of Scientific and Innovative Research (AcSIR)

Pilani- 333 031 (Rajasthan) INDIA

Email: [masiulelt@gmail.com](mailto:masiulelt@gmail.com), [sk\\_masiul@ceeri.res.in](mailto:sk_masiul@ceeri.res.in)

Mobile: +91-9460371579

Phone (office): +91-1596-252273

### **Abstract:**

Catalyst-free growth of InAs quantum dots (QDs) with different size and density was undertaken by metal organic chemical vapor deposition technique to investigate its capability on charge storage in GaAs metal-oxide-semiconductor (MOS) based non-volatile flash memory application. The QDs were grown both on p-type GaAs (100) substrates and high-k ZrO<sub>2</sub> dielectric layer, the later was deposited onto ultrathin GaP layer passivated GaAs substrates. QDs were grown on GaAs substrates under normal atmospheric pressure at 380 – 450 °C. The QDs were found to be round shaped, single crystalline and well distributed. To demonstrate the efficacy of QDs as charge storing nodes and the effect of QD size on charge storage behavior, GaAs MOS based memory devices with structure Al/ZrO<sub>2</sub>/InAs QDs/ZrO<sub>2</sub>/(GaP)GaAs were fabricated. Leakage current characteristics in different GaAs MOS devices, viz. GaP passivated, unpassivated, and QDs enabled devices is analyzed. In another study, fabrication of graphene based flexible solar cells and strain sensors are reported.

**Keywords:** Quantum dots, metal-oxide-semiconductor, charge storage, graphene, flexible.

**BIODATA :** Dr. Sk. Masiul Islam joined as a Scientist at CSIR-CEERI, Pilani, Rajasthan in 2016. Currently, he is working in Semiconductor Device Design Group, CSIR-CEERI, Pilani as a Senior Scientist. He is also serving as Assistant Professor in Academy of Scientific and Innovative Research (AcSIR), India. He has been awarded Ph.D. from IIT Kharagpur. His current research interest is focused on III-V semiconductors, graphene based flexible electronics, nanobiosensors and thin-film solar cells. Dr. Islam has published over 40 research articles in peer-reviewed journals with international reputes as well as presented papers in national and international conferences.