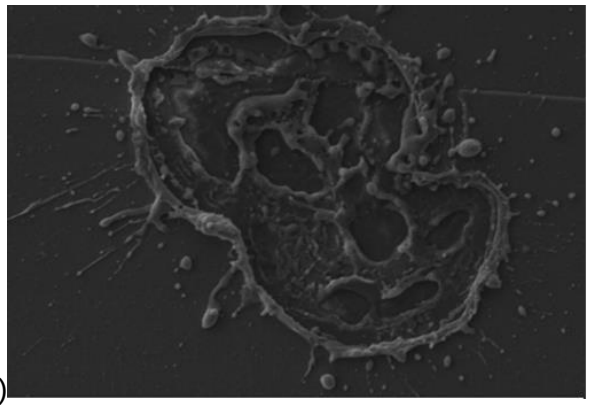
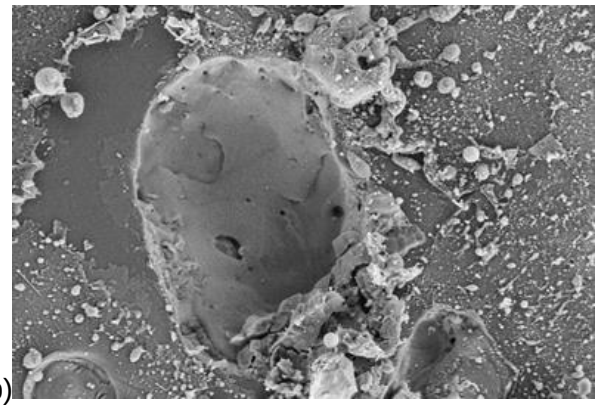
# Light Weight and Flexible High-Performance Electronics

Although crystalline silicon forms a material of choice for major technological applications, there are applications that are not possible with silicon. These applications include flexible electronics, bio-sensing, transparent electronics and foldable displays. These applications require novel materials with suited capabilities and have inspired research in the field of organic semiconductors, metal oxides based semiconductors, non-crystalline silicon and 2D materials including graphene and TMDs.

Reliability study on these newer materials pose multiple interesting challenges, some of them being:-1. Disordered semiconductors have states in the gap and their device physics is quite different from crystalline materials due to Anderson's localization 2. ESD behavior in these materials is tremendously affected by defects and their nature 3. Charge transport and other aspects of device reliability are still under investigation and a complete understanding is still missing 4. Experimental investigations require the fabrication of TFTs based on different semiconductors to qualify unifying ideas of the impact of disorder in general.

With these novel challenges in mind, we at MSDLab, work on exploring the Electrostatic Discharge reliability of these materials with an aim of aiding technology development in these areas and providing a thorough understanding of ESD physics in these devices. Our work focusses on understanding the physics of device degradation with a particular interest in $V_T$ shift, mechanisms leading to device failure, charge transport under high field high-frequency conditions, high field induced material changes lead by optical phonons and impact of device engineering on ESD reliability.

We have published articles that have been presented in conferences including IRPS and EOSESD.

(a)  (b) 

SEM image of the damage locations in (a) a-Si:H TFT (B) Pentacene OTFTs showing different exposed layers due to burn-out on account of current crowding.