

# Advanced Electronics Laboratory

School of Engineering Science, Kochi University of Technology



PI: Yusaku Magari (Dr. Eng.)

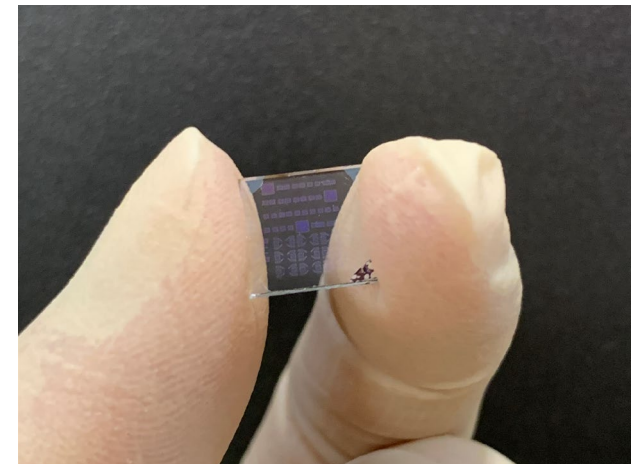
Email: [magari.yusaku@kochi-tech.ac.jp](mailto:magari.yusaku@kochi-tech.ac.jp)

185 Miyanokuchi, Tosayamada, Kami City, Kochi 782-8502, Japan

Research Areas: Solid State Physics, Thin Film Technology,  
Electronic Device Engineering

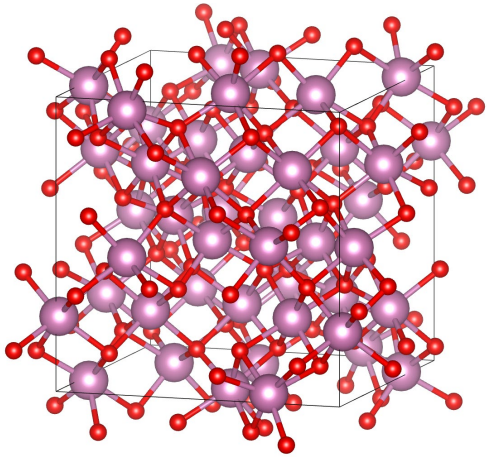
## Research Overview

Cloud computing, IoT, and AI are driving today's information society, and the importance of semiconductor devices continues to grow. Our laboratory focuses on oxide semiconductors, a promising class of next-generation materials. We are developing novel thin-film synthesis methods and evaluating their properties, while also promoting research on their application to electronic devices. By exploring the forefront of oxide electronics, we aim to create innovative semiconductor devices that contribute to future society.



# Oxide semiconductor device technology

## Material design



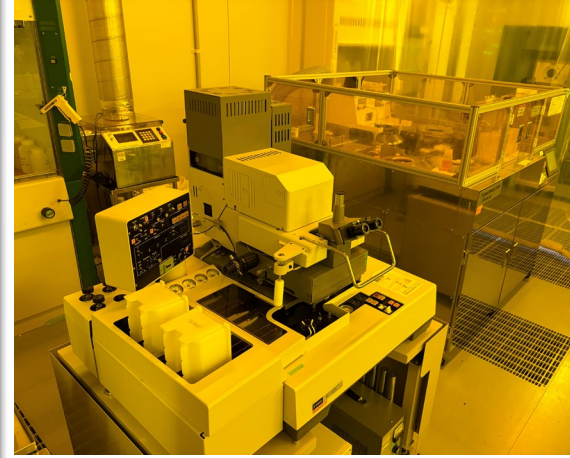
Development of new electronic materials for next-generation devices toward a sustainable society.

## Thin film growth



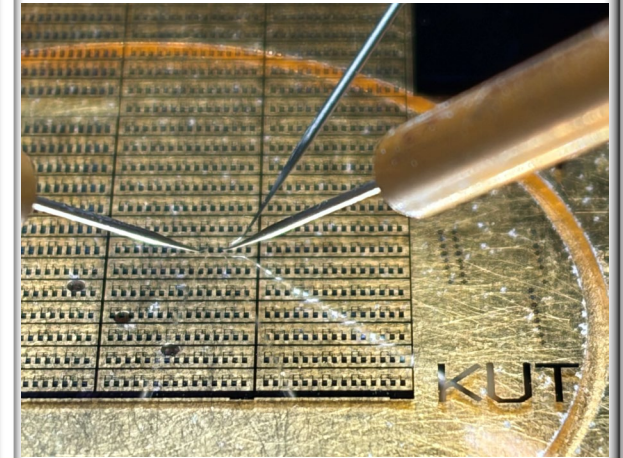
Growth of high-quality thin films using various deposition techniques, including PVD, CVD, and ALD.

## Device fabrication



Device fabrication with a comprehensive perspective on materials, processes, and device structures.

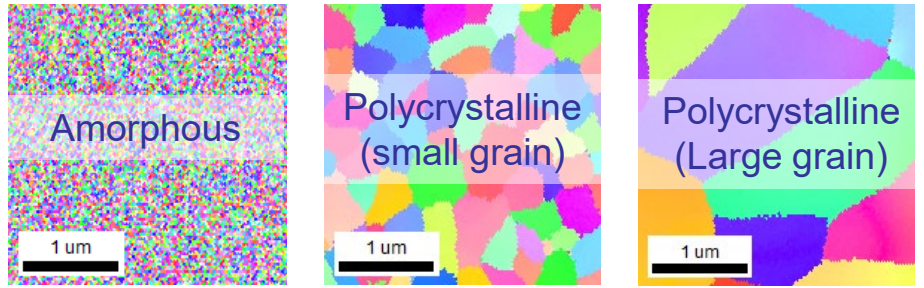
## Material and device characterization



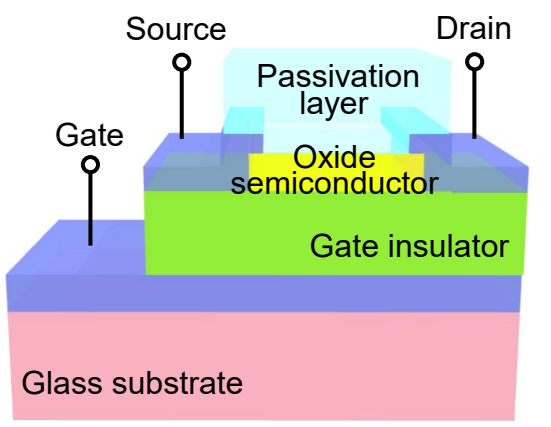
Evaluation and analysis of the structural, optical, and electrical properties of materials and devices.

# Research topics

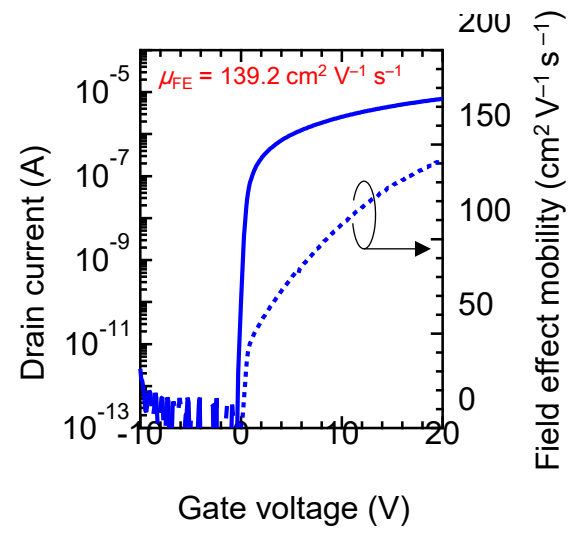
## Development of Novel Synthesis Methods for High-Mobility Oxide Semiconductor Devices



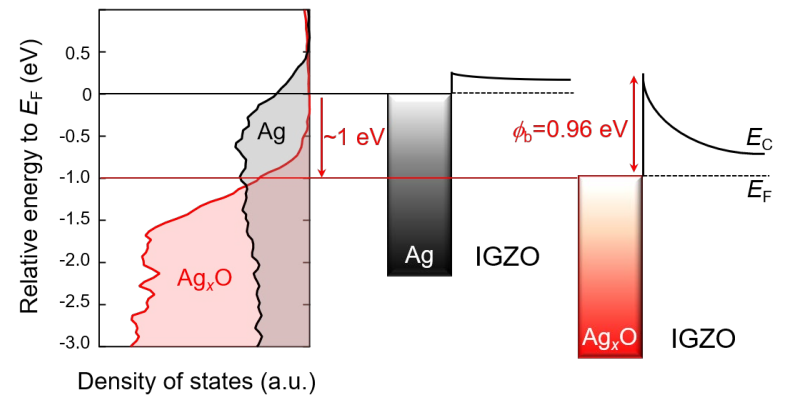
Low temperature (~200 °C) solid phase crystallization



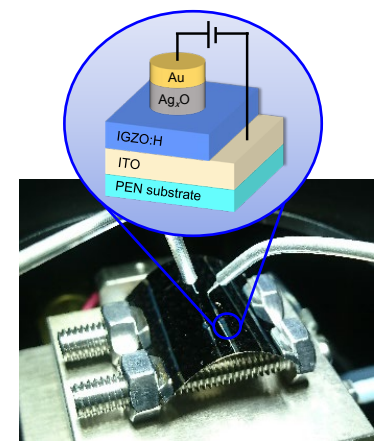
Thin Film Transistor (TFT)



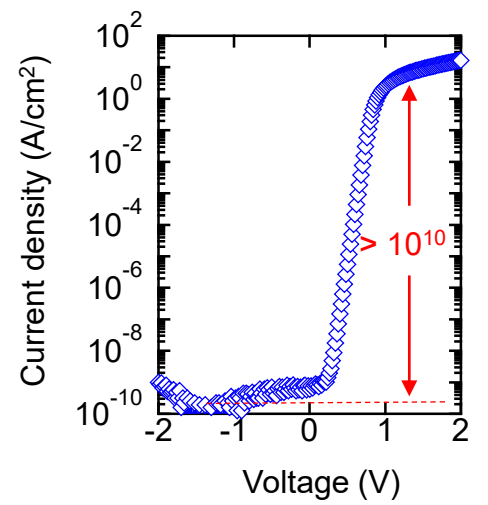
## Development of Advanced Oxide Schottky Devices for Next-Generation Edge AI Applications



### Schottky Junction Interface Engineering



Flexible Schottky Diodes



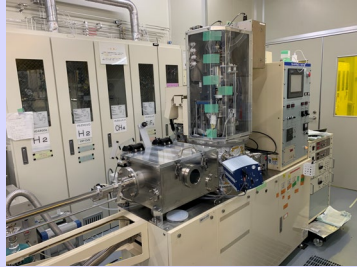
# KUT research facility

## Thin-Film / Device Fabrication in a Cleanroom

Sputtering-A



Sputtering-B



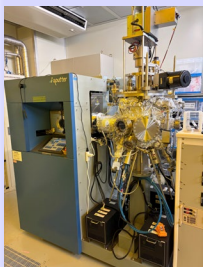
Sputtering-C



Sputtering-D



Sputtering-E



PE-CVD



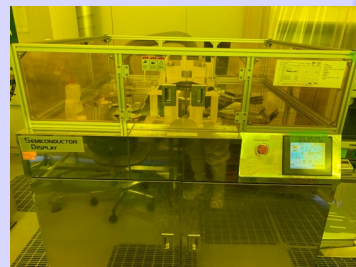
Thermal Evaporation



Mask Aligner



Coater/Developer



UV-Ozone treatment



ICP-RIE



RTA (4 inch sub.)



RTA (20 mm sub.)

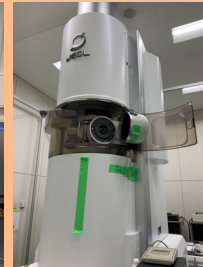


## Characterization and Analysis

XRD



TEM



AFM



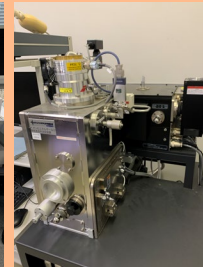
TDS



UV-Vis spectrophotometer



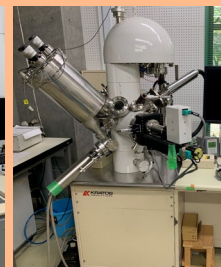
PYS



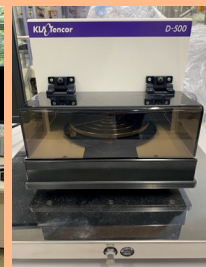
SEM



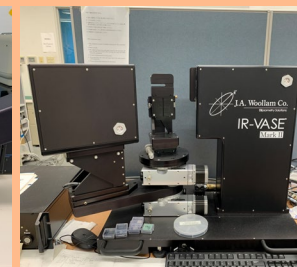
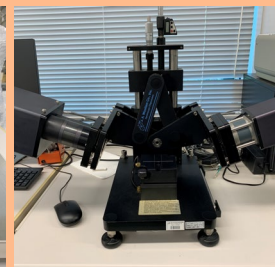
XPS



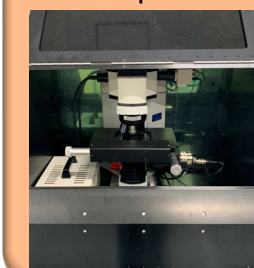
Alpha-Step



Spectroscopic Ellipsometer (Visible to Near-Infrared, Infrared)



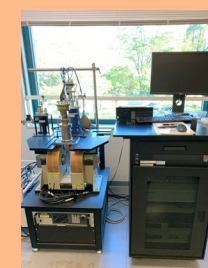
Raman Spectroscopy



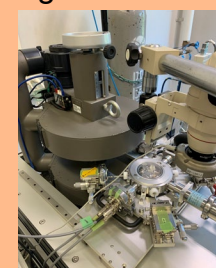
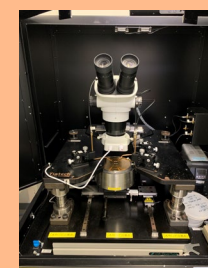
FTIR



Hall Effect Measurement



Manual Probing Stations



# Required skills and knowledge

- Basic understanding of semiconductor physics, surface science, and properties of metal oxides
- Knowledge and hands-on experience in:
  - Thin-film deposition techniques (sputtering, CVD, ALD)
  - Thin-film characterization methods (Hall measurements, XRD, XPS, optical measurements)
  - Device fabrication processes (photolithography, wet and dry etching)
  - Device characterization (electrical measurements)