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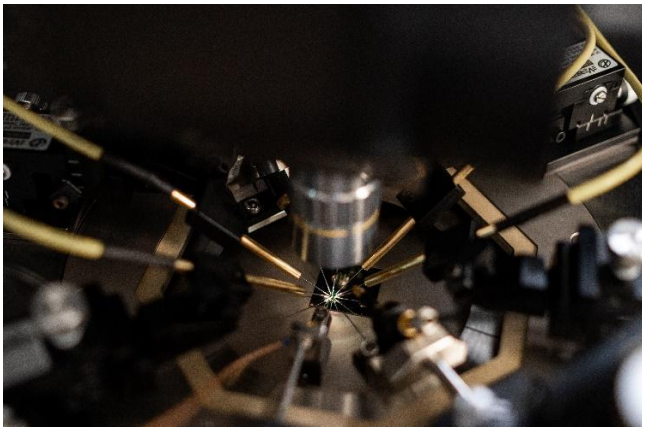
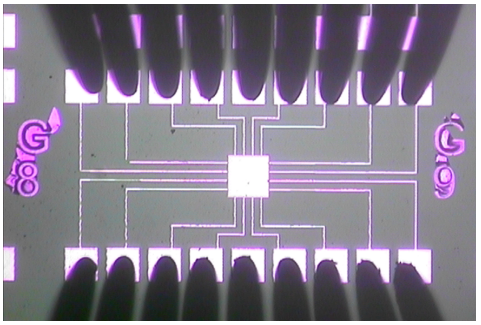
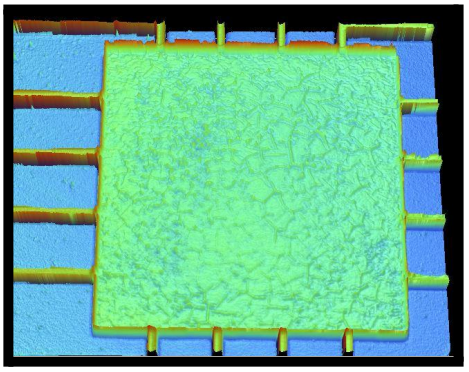
ASIC² ARCHITECTURES SYSTEMS INTELLIGENT COMPUTING INTEGRATED CIRCUITS

Characterization of Novel Electrical Coating PUF Dies for Cyber Security

Traditional approaches to storing secret keys in memory for cryptographic applications are susceptible to physical attacks when an attacker gains access to the storage medium.
To address this issue, physically unclonable functions (PUFs) have emerged as a novel concept for secure key storage.
PUFs store the cryptographic key as unique analog identifiers within the hardware, rather than in memory elements, making them resilient against physical attacks.
Most existing PUFs rely on variations in process parameters of Si-based integrated circuits (ICs), but their dynamic range is limited due to industry efforts in minimizing these variations.
In this research, we propose the study of novel coating-based PUFs that leverage nanoscale inhomogeneity, randomness, and uniqueness in nanomaterials and nanostructures.
Our study encompasses the design, simulations, fabrication, and characterization of physically unclonable coatings, along with the development of metrics to evaluate their effectiveness.







Project Goals:
In this project, the students will analyze and characterize real hardware primitives against cyber attacks by developing an automatic measurement setup and evaluation scripts.
Research results will contribute to the development of future chips that will offer protection against cyber attacks for sensitive products (autonomous cars, military equipment, etc.).

The students will:

- Gain practical experience by working with lab instruments including Automated Probe Station
- Characterization of electrical properties and their random nature
- Characterization of challenge-response pairs
- Make a data analysis according to known metrics

Prerequisites:

- **Courses:** Electrical Engineering Lab 1+2

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