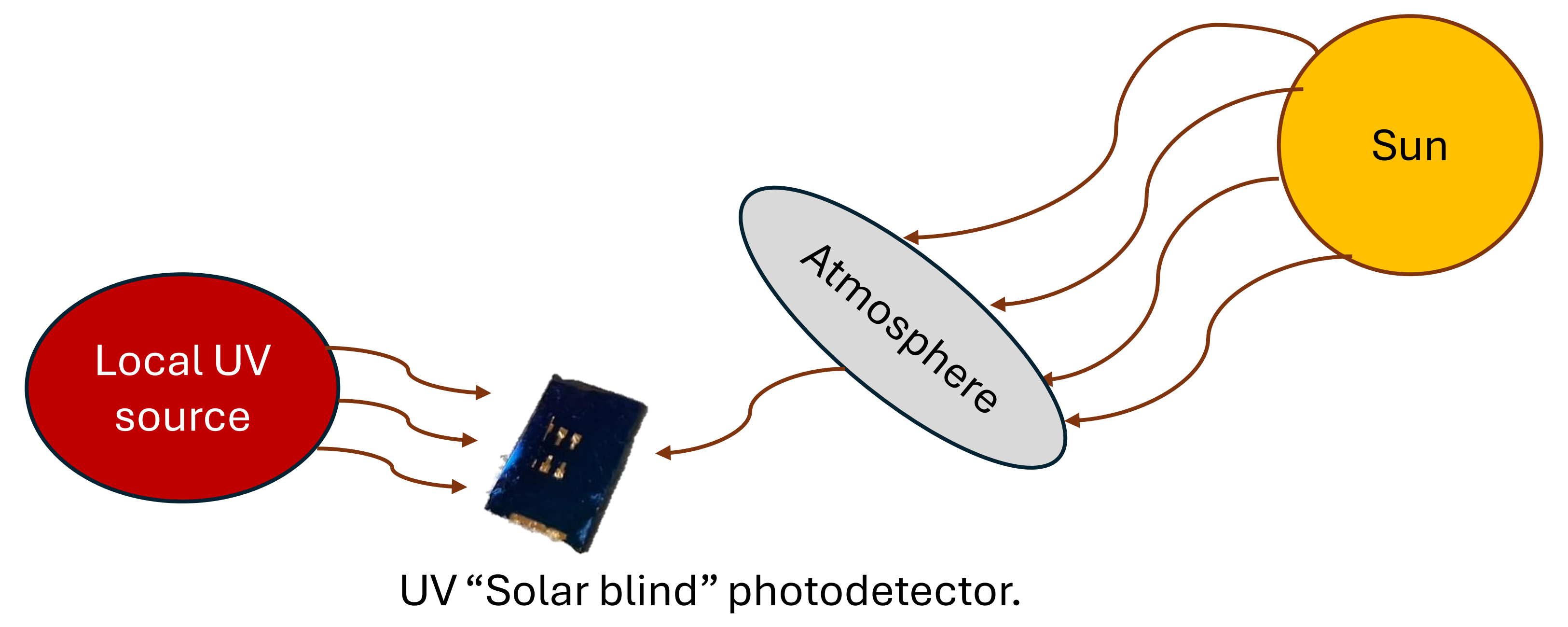
PIC-2 Pitch

Controlled Modification of Ga_2O_3 Interfaces for Photovoltaic and Photoconductive UV Detectors



UV “Solar blind” photodetector.

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M-S-M Fabrication

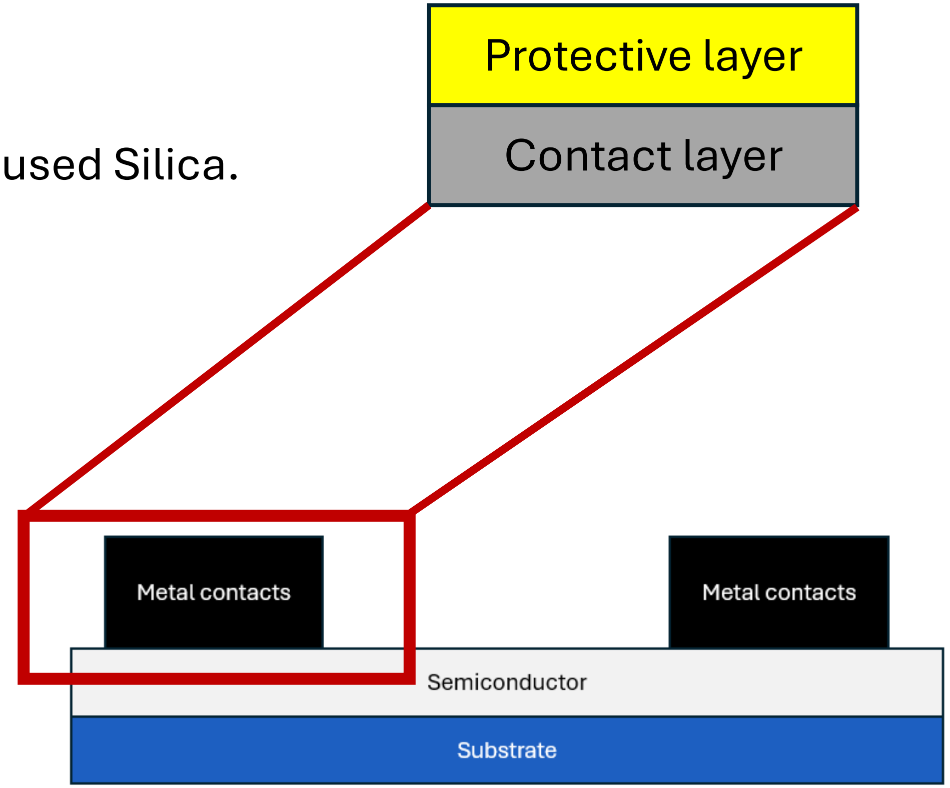
Protective layer: Gold (Au)
- ➢ Protects oxidation.

Contact layer: Nickel (Ni), Platinum (Pt), Titanium (Ti).
- ➢ Establishes the contact behavior.

Substrates: Si, $SiO_2\ (monocrystalline)$, $SiO_2(amorphous)$-Fused Silica.

Material	Work function **(eV)**	Φ_B**(eV)**	**Type of contact**
$\beta - \mathrm{Ga_2O_3}$	4.00 ±0.05	-------	----------
Ni	4.95-5.52	0.95-1.52	Schottky
Pt	5.01-5.53	1.01-1.53	Schottky
Ti	4.3	0.3	Ohmic

Metal contact structure.

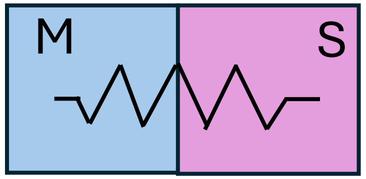


MSM structure.

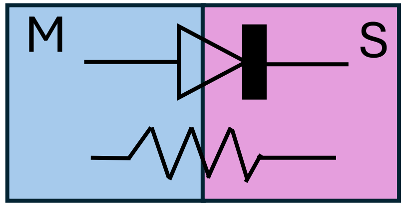
Intended Photodectors

Schottky photodiode

- ➢ Photovoltaic and Photoconductive mode.



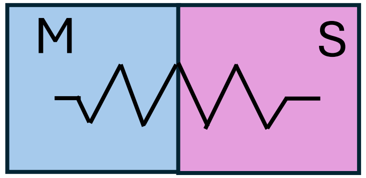
-Ohmic contact behavior.



-Schottky contact behavior.

Photoconductor

- ➢ Photoconductive mode.



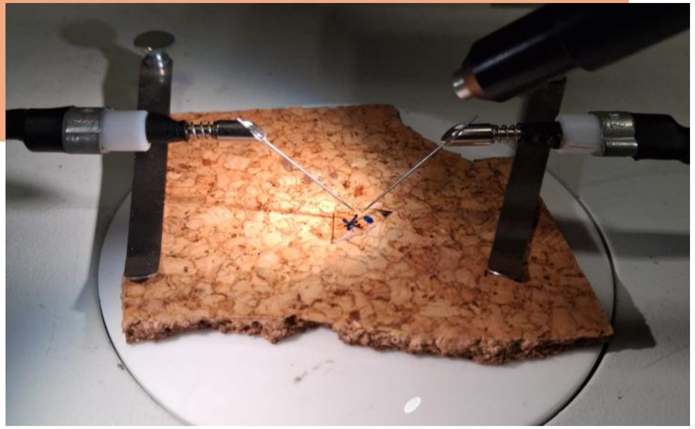
-Ohmic contact behavior.

🟧 N-type semiconductor (**Ga_2O_3**).

🟨 Schottky contact.

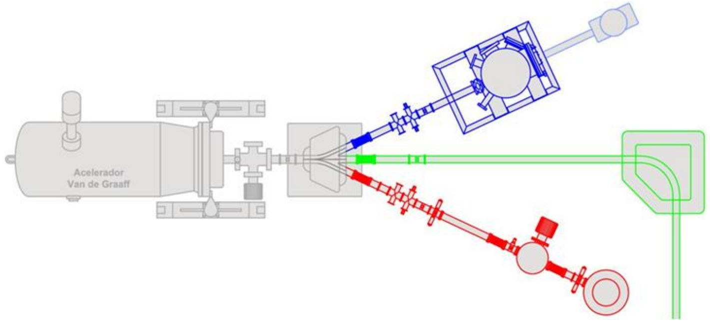
⬛ Ohmic contact.

Characterization process



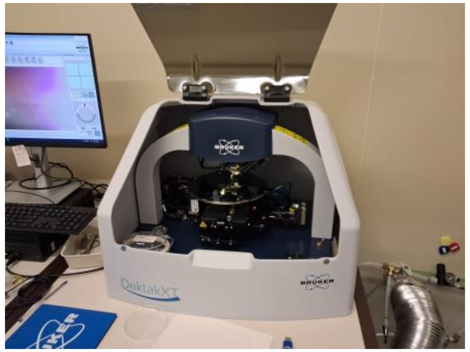
Electrical characterization (I-V) worktable.

- **Characterization techniques:**
  - Film Thickness- **Profilometry;**
  - Crystalline phase and lattice parameters - **X-ray diffraction, PIXE**;
  - Composition and thickness-**Rutherford backscattering spectrometry (RBS);**
  - Crystallinity of solids and Stress detection- **Raman spectroscopy**;
  - Electrical characterization;
  - Surface examination- **Atomic force microscopy(AFM);**
  - Surface morphology- **Scanning electron microscopy (SEM).**



Accelerator Van de Graaff.

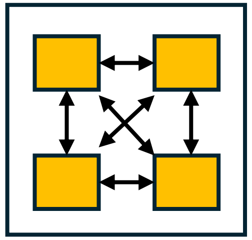
RAITH 150.



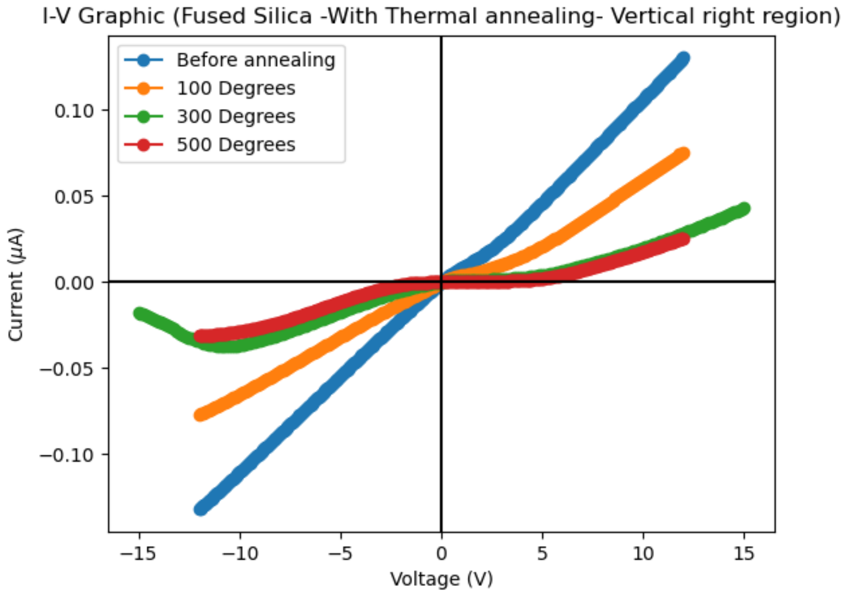
DektakXT.

Some Preliminary Results

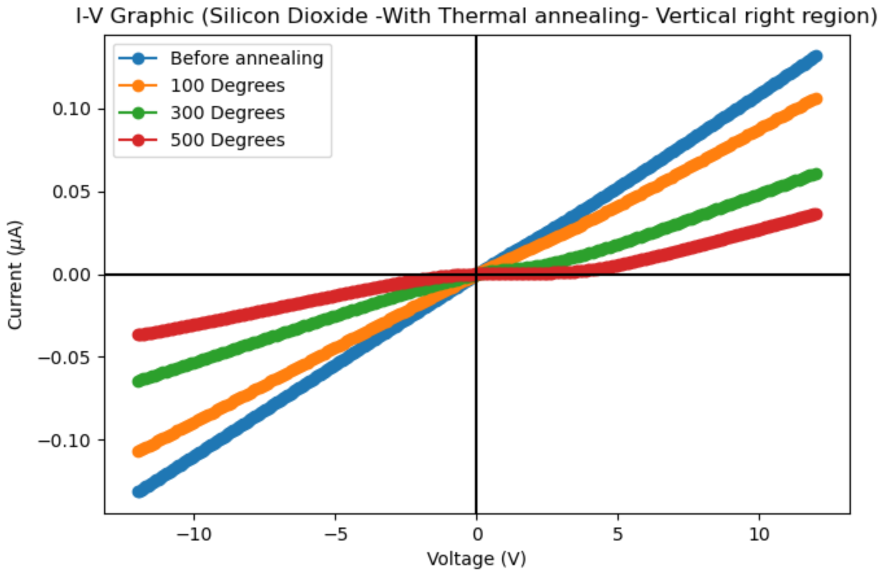
- **Electrical characterization:**
    - **Varying the annealing temperature.**
        - Sample used: Au-Ni.



Metal contacts measured directions.



I-V Graphic (Fused Silica -With Thermal annealing- Vertical right region)



I-V Graphic (Silicon Dioxide -With Thermal annealing- Vertical right region)

Conclusion: Increase of temperature → **Change of contact behavior (Schottky).**