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## Realization and characterization of vertical PIN diode on 100 diamond

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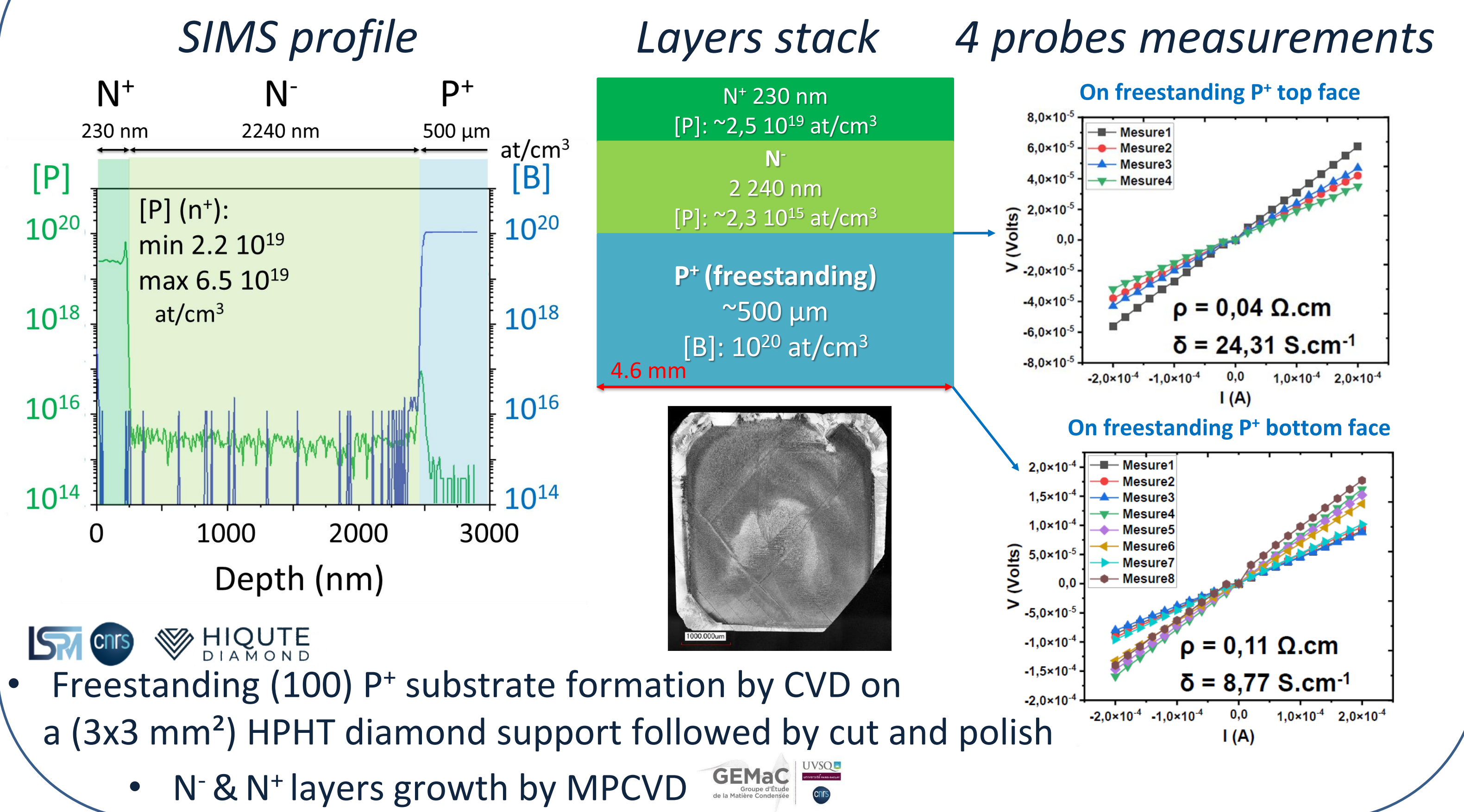
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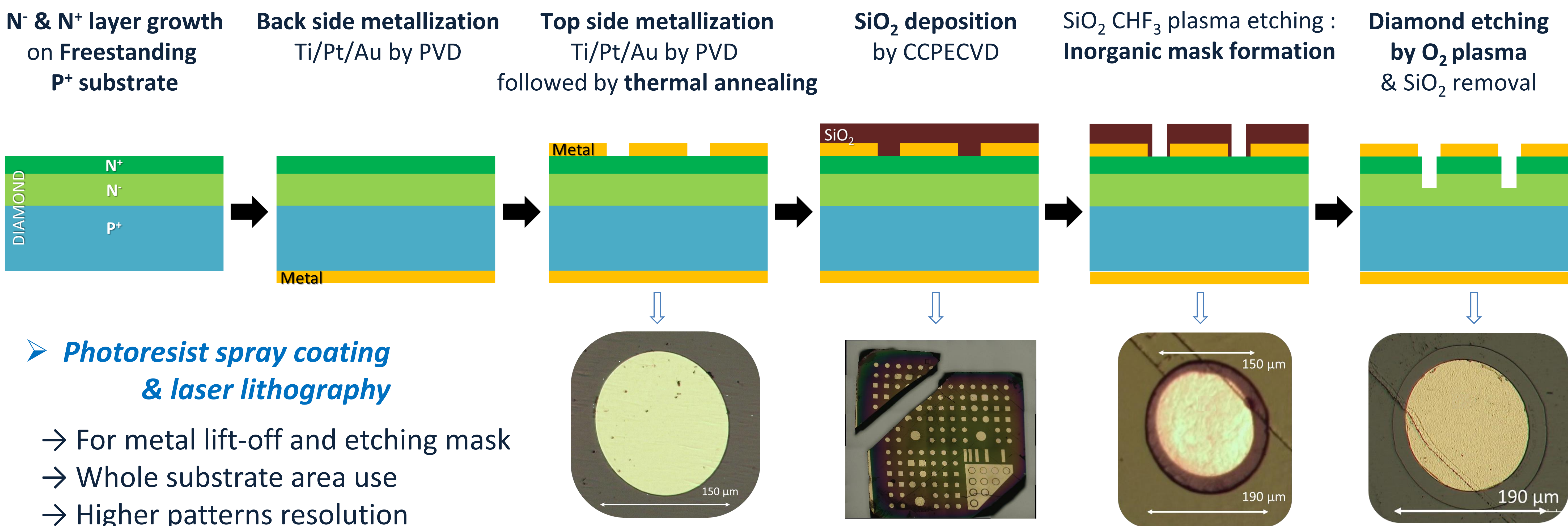
## Objectives

- Fabrication of the 1st high voltage vertical (100) PIN diodes on diamond
- Manufacture of (100) freestanding heavily boron doped layer (P<sup>+</sup>) with low density of dislocations
- Optimisation of (100) N<sup>+</sup> layer growth with low surface roughness.
- Mastery of microfabrication technological steps

## PIN layers stack

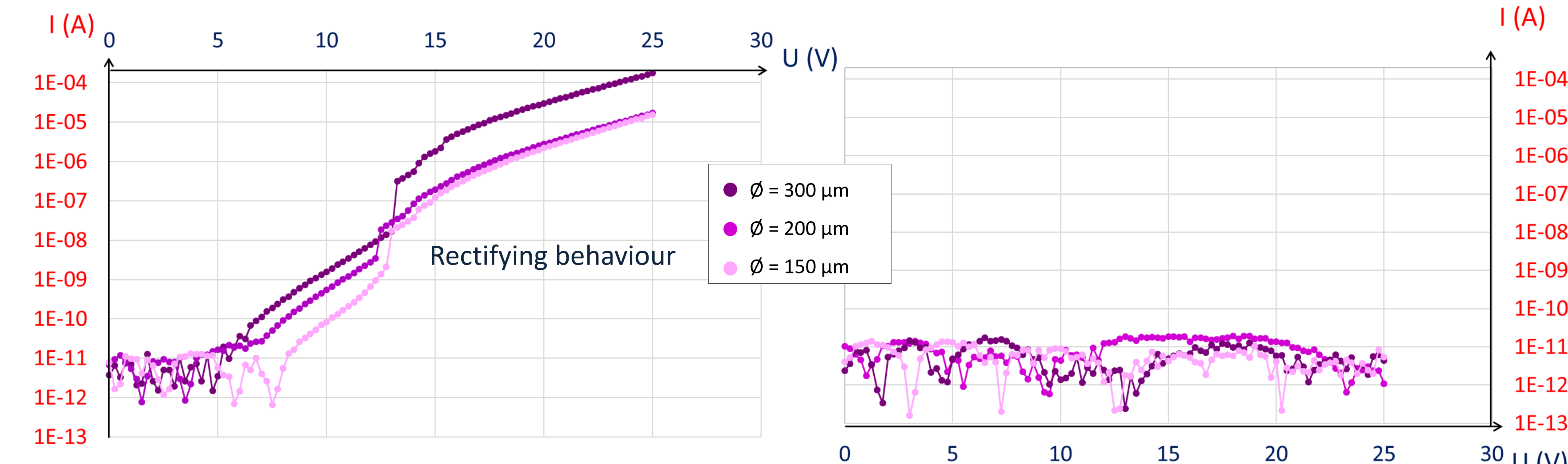


## Technological key steps



## Electrical characterizations

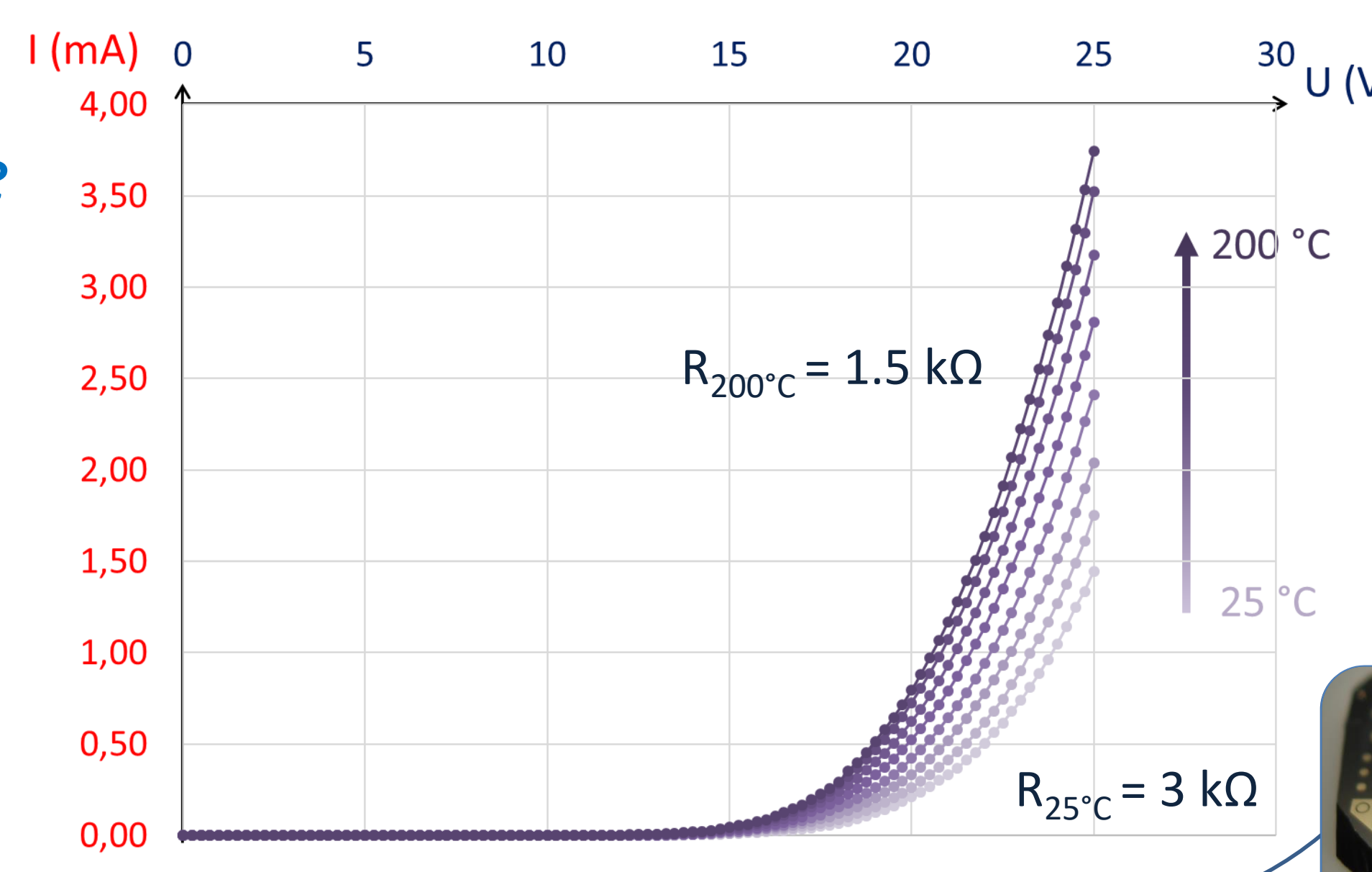
### Forward & Reverse I(V) measurements for 3 types of circular diodes



### Forward current @ different temperatures for a 200 μm square diode

- Low variation with temperature
- 10 A/cm<sup>2</sup> @ 200 °C

- Characterizations in progress
- C(V) & OBIC measurements
- High temperature measurements (T = 600 °C)



## Conclusion

- ✓ A large freestanding (100) P<sup>+</sup> diamond substrate (4.6 x 4.6 mm<sup>2</sup>)
- ✓ A highly doped N<sup>+</sup> layer growth (2.5 x 10<sup>19</sup> at/cm<sup>3</sup>)
- ✓ First vertical PIN (100) diode layers fully grown by MPCVD
- ✓ Vertical PIN diode functionality is demonstrated: current flowing with on and off states

To be addressed...

- TCAD simulations of the PIN diode behaviour
- Complementary electrical characterizations (TLM, OBIC, C(V))

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