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Rzeczpospolita Polska



NP Fundacja na rzecz Nauki Polskiej Unia Europejska Europejski Fundusz Rozwoju Regionalnego





ENSEMBLE³ is a "Centre of Excellence in Nanophotonics, Advanced Materials and Novel Crystal Growth-based Technologies" located in Warsaw, Poland. It builds on the pioneering work of Prof. Czochralski and has world-leading expertise.

- Scientific unit, non profit LLC
- Who we Are

Located in Warsaw at the premises of Łukasiewicz-IMIF

🚊 Apparatus, patents – own

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Photonics Crystallized



Our Renowned

Partners









ENSEMBLE³ has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857543

It was jointly launched by the following renowned institutions from Poland, Germany, Italy and Spain: the Institute of Electronic Materials Technology and the University of Warsaw (Poland), the Karlsruhe Institute of Technology (Germany), the Sapienza University in Rome (Italy) and the nanoscience research centre nanoGUNE (Spain).





AllIBV single crystals Gallium Phosphide (GaP)

- Grown by LEC
- Diameter 2" or 3"
- Orientation <100> or <111> or <110>
- Available types and their parameters
 - undoped SI [ρ > 10⁷ Ω cm]
 - undoped n-type [n < 2 x 10¹⁶ cm⁻³; μ > 150 cm²/Vs]
 - doped with Sulfur (S)

n-type [n = 2 x 10¹⁷ to 5 x 10¹⁸ cm⁻³; µ > 90 cm²/Vs]

- doped with Zinc (Zn)

p-type [$p = 5 \times 10^{17}$ to 5×10^{18} cm⁻³]

- doped with Cadmium (Cd)

p-type [p = 2 x 10¹⁶ to 3 x 10¹⁷ cm⁻³]

- doped with Chromium (Cr) SI [ρ > 10⁷ Ω cm]



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AllIBV single crystals Gallium Phosphide (GaP)

- Gallium Phosphide is used in **manufacturing low-cost red, orange, and green light-emitting diodes (LEDs)** with low to medium brightness.
- Gallium Phosphide can be used in the **optical switches.** Optical switch is a key component in the nowadays optical network.
- Gallium Phosphide applications:
 - low-cost LEDs, red, orange, and green light-emitting diodes
 - THz applications, emitters and detectors
 - optical switches







Oxides

Nonlinear Optical (NLO) Materials

- NLO materials allow us to change color of a light beam, its shape in, space and time,
- NLO materials example Magnesium Aluminate Spinel doped with Cobalt (MgAl₂O₄: Co, MALO), Yttrium Aluminium Garnet doped with Vanadium (YAG: V3+), Chromium (YAG: Cr4+) or Cobalt (YAG: Co2+).
- MALO, a non-linear absorber, used in microlasers with 10 kW impulse and rangefinder cameras up to several kilometers range.



MALO



Other materials ENSEMBLE³ offer



Photonics Crystallized

We produce and develop variety of materials

- AllIBV single crystals: GaAs, InAs, GaP, InP, GaSb
- Other materials: SiC, Bi₂Te₃, Bi₂Se₃, BTS, BST
- **Oxides:** Y₃Al₅O₁₂, Lu₃Al₅O₁₂, LuAP, Gd₃Al₂Ga₃O₁₂, YAlO₃, GdCa₄O(BO₃)₃, YVO₄, Yb: CALGO, TSAG, MALO, YAG: V3+, YAG: Cr4+, YAG: Co2+







Other materials ENSEMBLE³ offer



Crystallized

We sell in different forms and shapes tailored to your needs

- polished epi-ready wafers, wafers diced into smaller parts, pieces of other shapes, i. e. oriented seeds,

cubes and targets, polycrystalline boules

We share our knowledge

- *know-how* on the synthesis crystal growth and Chemico-Mechanical Processing (CMP) of our materials









