



**Surface
materials engineering**



Creation **1953**



Innovative corporate **social** model



86 industrial plants
in **21** countries



Global footprint



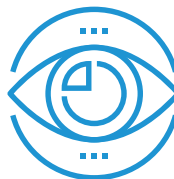
3150 collaborators



**R&D to
industry**



274 M€ turnover (2020- 21)
50 M€ of investment



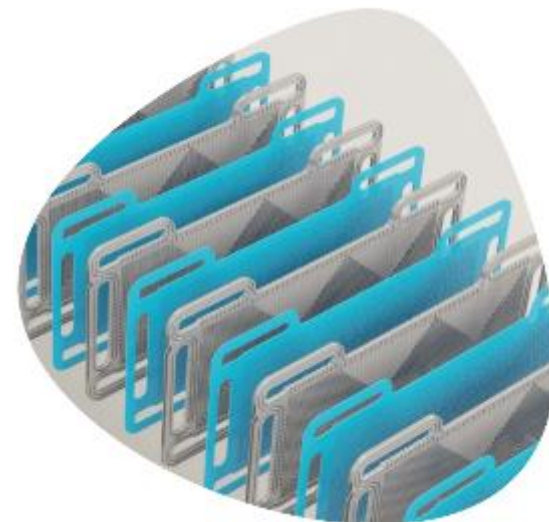
Progres



TRIBOLOGY



PHOTONICS



**TECHNOLOGIES
OF THE HYDROGEN**



MOBILITY



MEDICAL



DEFENSE



CONSTRUCTION



GREEN ENERGY

Our Business Model: Vertically Integrated

R&D

80 people with various skills

Surface sciences, materials, process, characterizations, machine



Engineering

From key technologies to machine designing and manufacturing,



Surface treatments on your components from prototypes to mass production



Components

Designing and manufacturing bushings or friction components and optical components



From R&D To production... worldwide



Vacuum deposition - PVD - PACVD



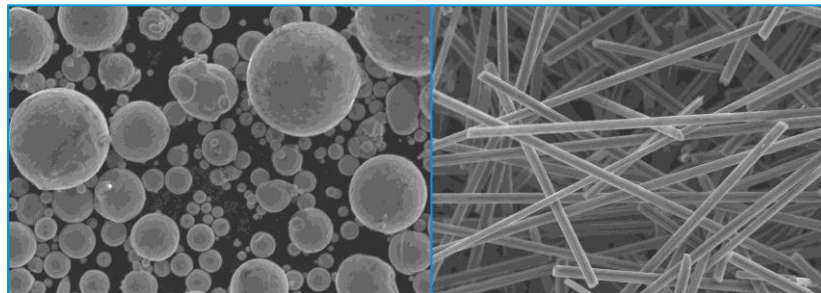
Thermochemistry - Nitriding



Mechanical friction components



Powder



Materials & equipment (PVD)

Substrats

- ❖ Metallic
- ❖ Polymer
- ❖ Composites
- ❖ Ceramics
- ❖ Glass

Coatings

- ❖ Nitrides : TaN, AlN, SiN ...
- ❖ Carbon base: DLC, SiOCH ...
- ❖ Metals : Au, Ag, Al, Ta, Hf ...
- ❖ Oxydes : SiO₂, TiO₂, Al₂O₃, CeO₂, Ta₂O₅, HfO₂...

Deposition equipment

Duplicated Machine



In line



1 m x 0,8 m

H = 2,8 m Ø = 1,1 m

H = 2m Ø = 2m

Large dimensions

5 modules







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SURFACE MATERIALS ENGINEERING

External Growth :

- ❖ Decembre 2020 : Abrisa (USA- Ca)
- ❖ April 2021 : Kerdry (France)
- ❖ May 2021 : Fichou (France)
- ❖ October 2021 : Acerde (France)
- ❖ Juin 2022 : Optimask (France)
- ❖ Juillet 2022 : Neyco (France)

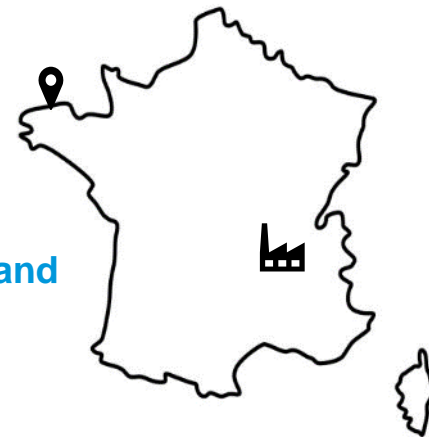




KERDRY
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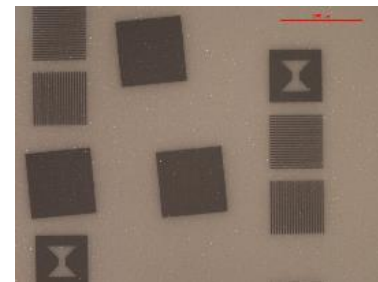
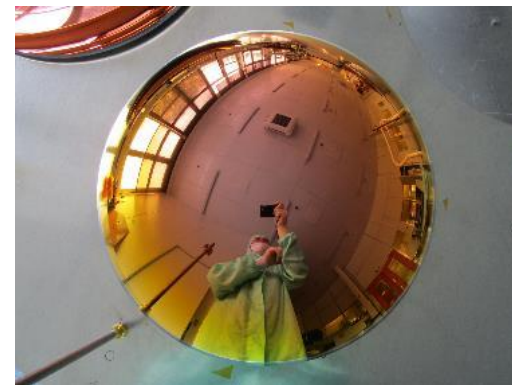
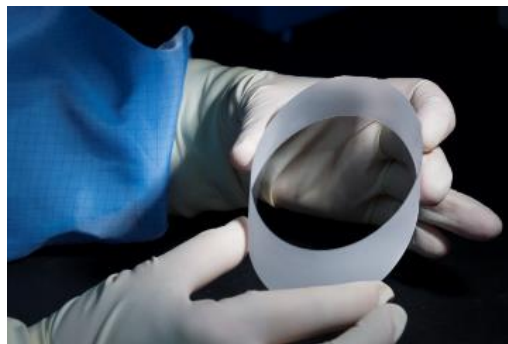


- ❖ **KERDRY**, custom thin film coating for advanced technologies.
 - ❖ From **R&D** to **mass production**
 - ❖ Wide range of markets : space, defense, metrology, photonics...
- ❖ Since 2003, KERDRY has created an industrial tool adapted to **optical and metallic treatments** by thin film deposition under high vacuum and in controlled environment.
- ❖ **More than 15 PVD** machines is installed in more than 1000 m² of **clean rooms**. 35 chambers in the group.
- ❖ **Optical treatments from UV to IR** (anti-reflection, mirror,
 - ❖ intense black, dichroic, filter...)
- ❖ Capacity **up-to 1.40 m (55')** substrate diameter
- ❖ ISO 9001:2015 and ISO 14001 certifications



Markets:

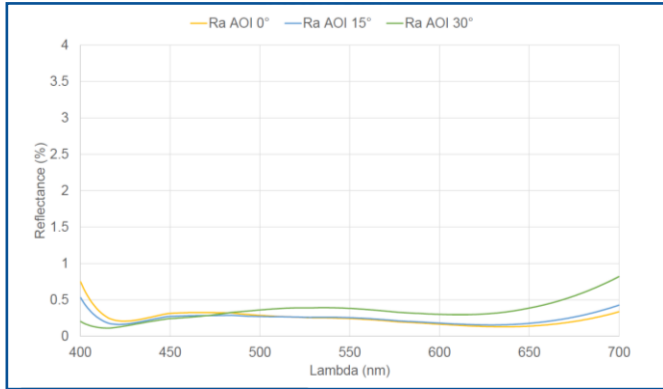
- ❖ Microelectronic
- ❖ Aeronautic
- ❖ Defense
- ❖ Industry
- ❖ Spatial
- ❖ Medical
- ❖ Luxury





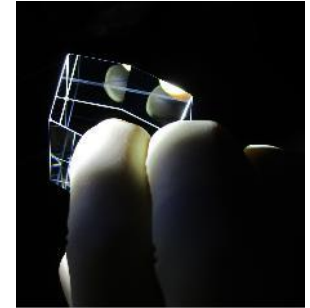
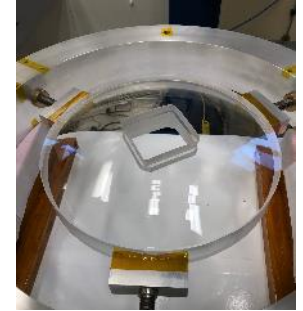
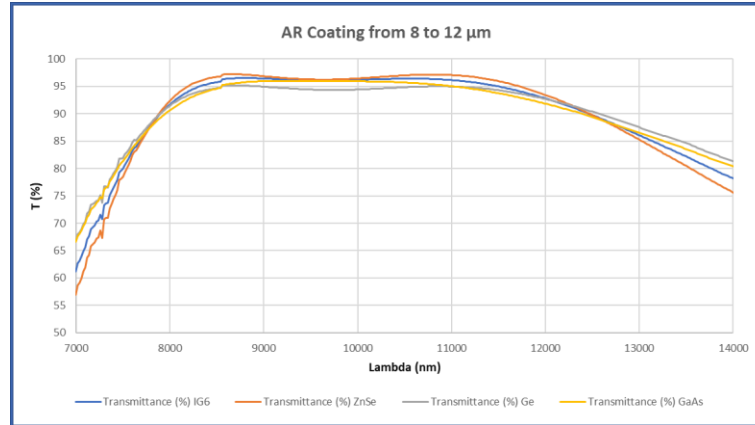
Antireflective coatings (V-coating, W-coating, wide band BBAR...) Materials : TiO_2 , Ta_2O_5 , HfO_2 , SiO_2 , MgF_2 , ZnS, Ge, hydrophobe

KERDRY



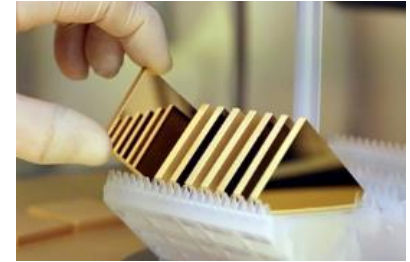
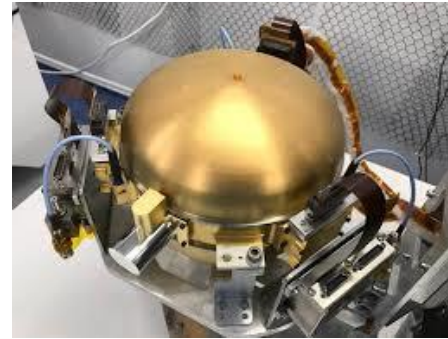
Typical visible AR Coating (on 1 side)

Typical infrared AR Coating (on 2 sides)



❖ Metallic & Dielectric Mirrors

- ❖ Silver, Aluminum, Gold Mirror
- ❖ Dielectric Mirror : $R > 99,5\%$



SEIS – Mars InSight Program



*CTA Project
(more than 150
mirrors done)*

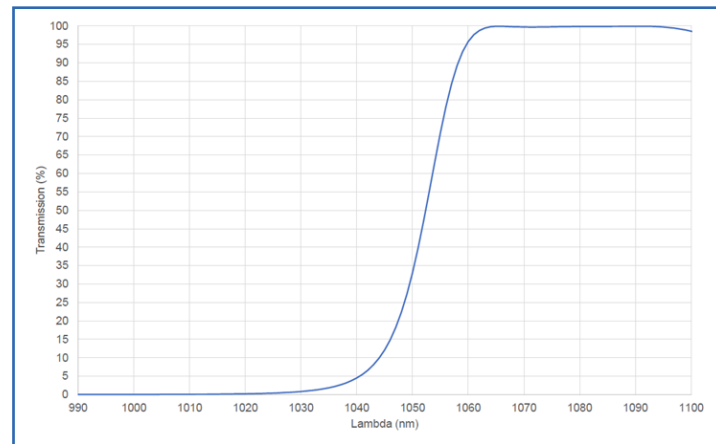
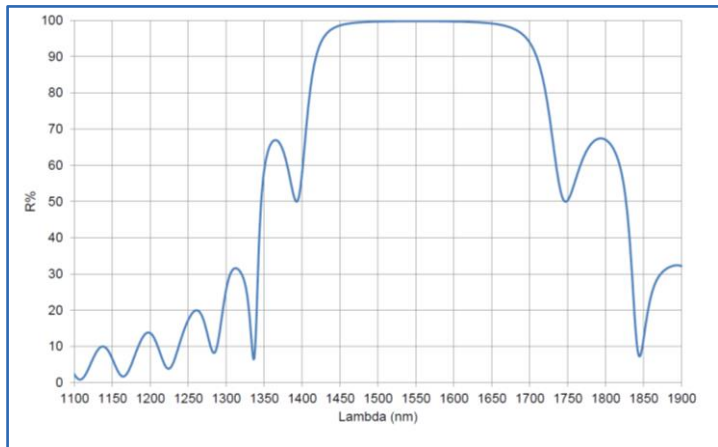




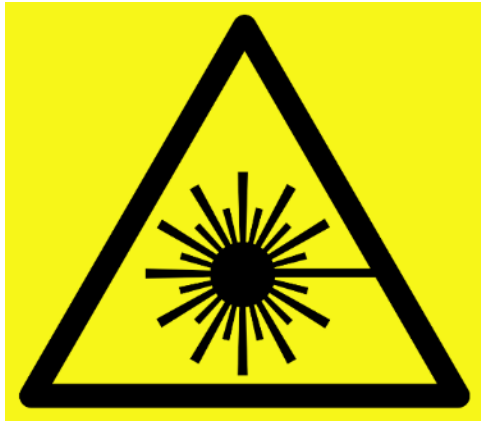
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- ❖ Custom Filters
- ❖ Bragg Mirrors



- ❖ The Laser Damage Threshold for AR coating is up to **30 J/cm²** at 1064 nm with 10 ns pulses.
- ❖ The Laser Damage Threshold for Mirror Rmax coating is up to **15 J/cm²** at 1064 nm with 3 ns pulses.





Black Coating:

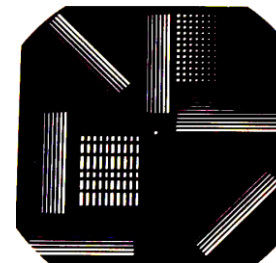
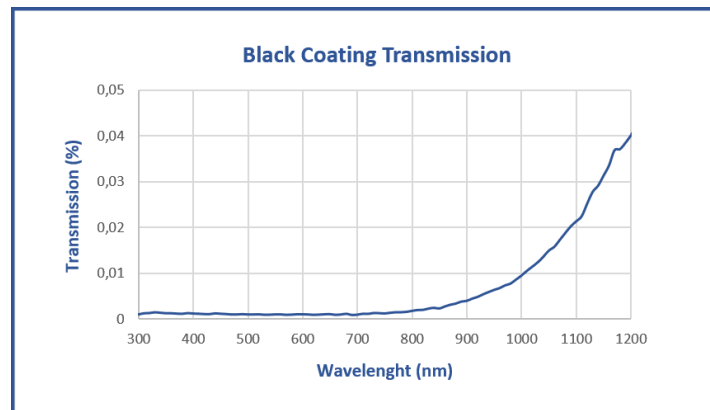
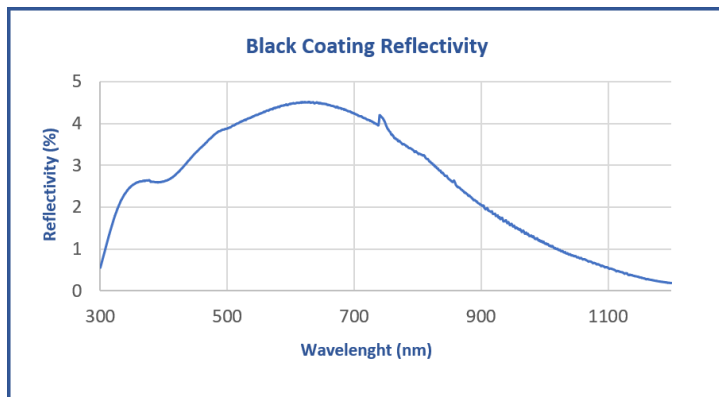
Low Transmittance ($T < 0.01\%$)

Low Reflectance

Spectral band adapted to customer specifications from 0.3 μm to 3 μm

On flat surfaces (200 mm diameter)

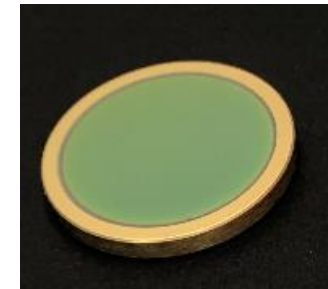
Sentinel-5 Component



- ❖ Metallization on all types of substrates (glass, single crystals, organic), by **electronic beam deposition or sputtering**
 - Soldering
 - Air tightness of packaging
 - Conductivity
 - Materials : Ti, Cr, Pt, Ni, Au, Pd, Cu, Ti, Pd, W, B4C
 - ...
 - Coating at low temperature

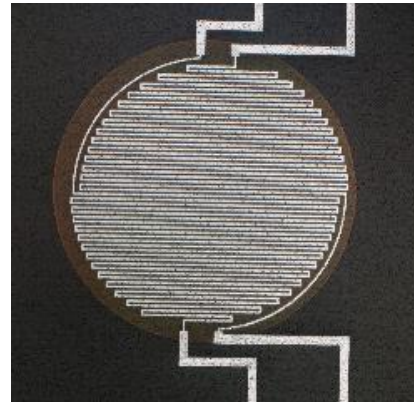
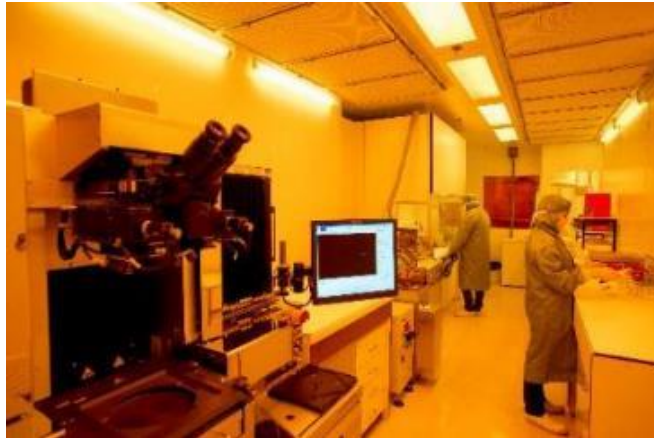
- ❖ ITO coating ($R < 15 \Omega/\square$, $T > 85\%$)

- ❖ **Combination of metallic and optical coatings on the same substrate**

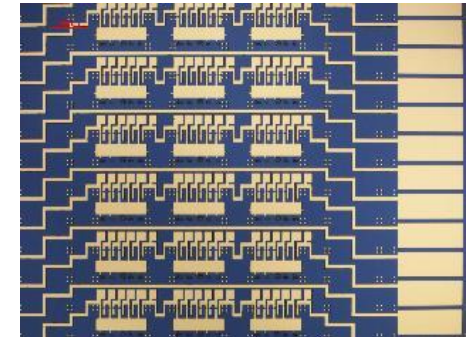
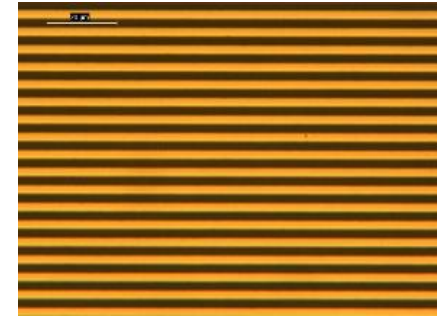


❖ **Photolithography masking with 8" equipments**

❖ Resolution better than $2\ \mu\text{m}$

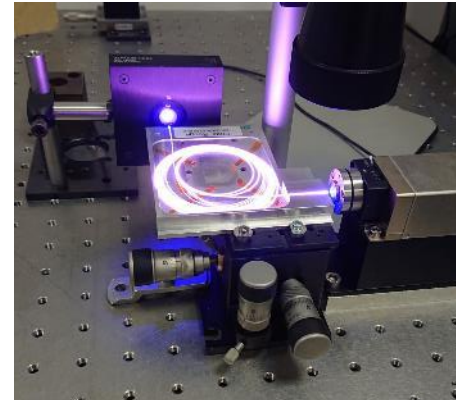


Array with a step of $5\ \mu\text{m}$



Support and Development on photolithography and coating technologies

- ❖ Project from design to production of final product (substrate, coating, dicing, laser etching...)
- ❖ Project on development of mirrors for giant telescops
- ❖ Collaborative Project on development of filters on optical fibers for visible lasers





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