Les verres de chalcogénures

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Sommaire

- Qu’est-ce que les verres de chalcogénures?
- A quoi servent ces verres?
- Que sont les défis actuels?
- Et les perspectives?

Sommaire

- **Qu'est-ce que les verre de chalcogénures?**
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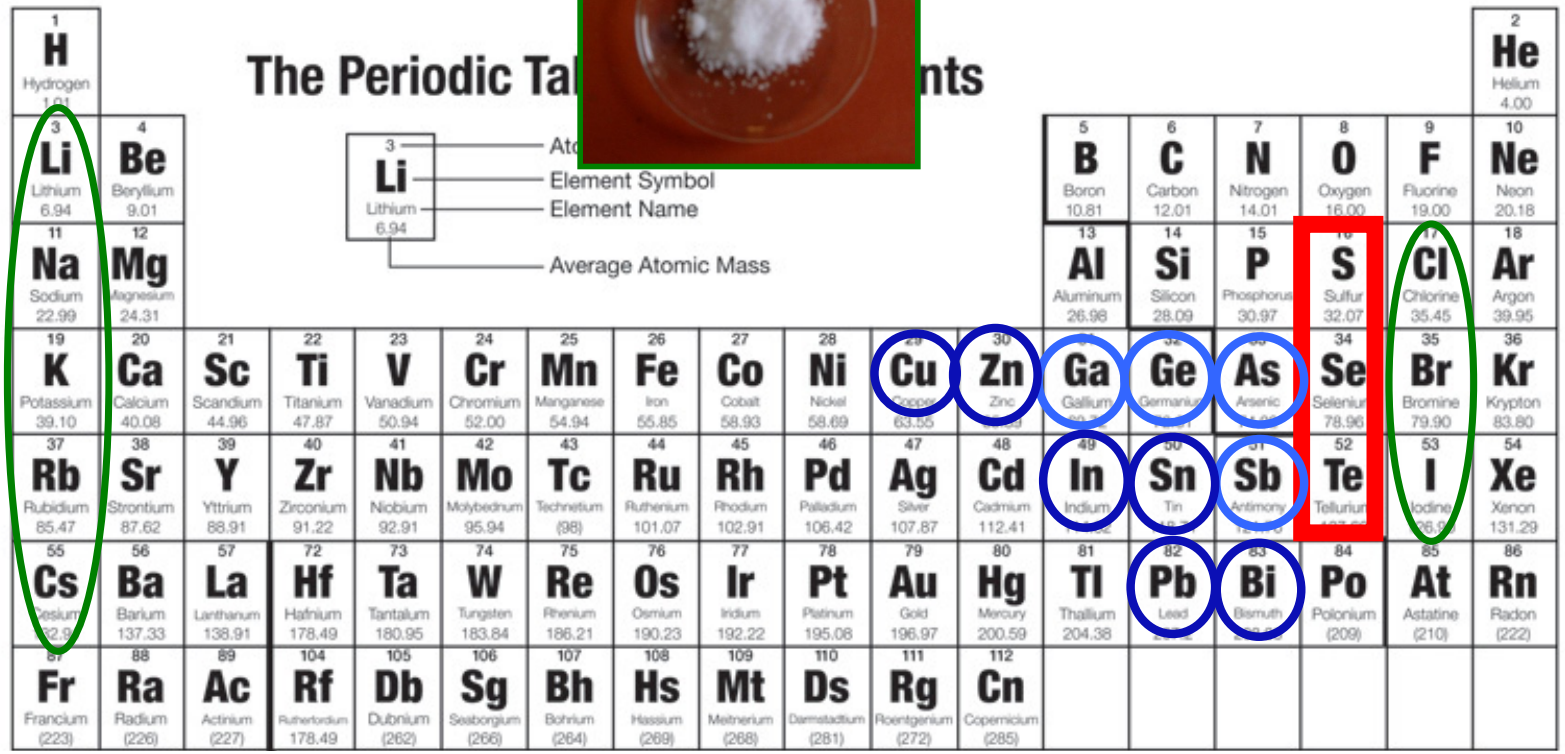
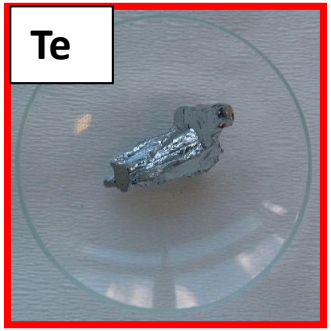
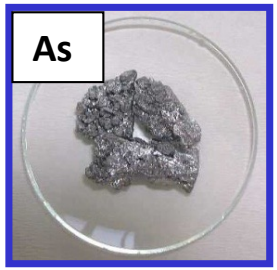
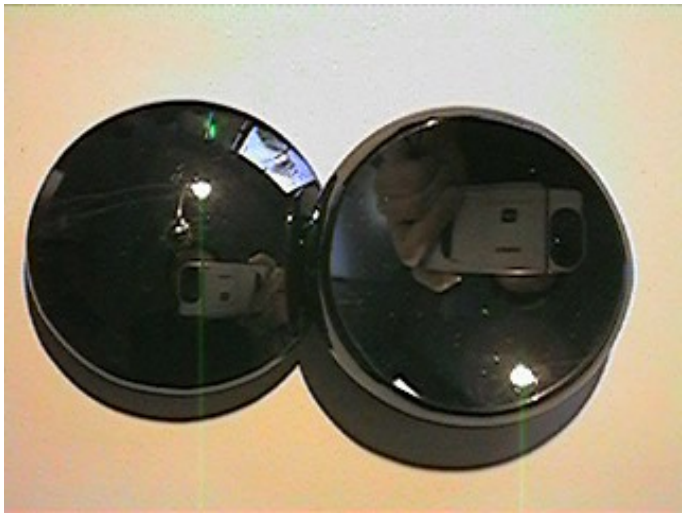
Chalcogenide glasses

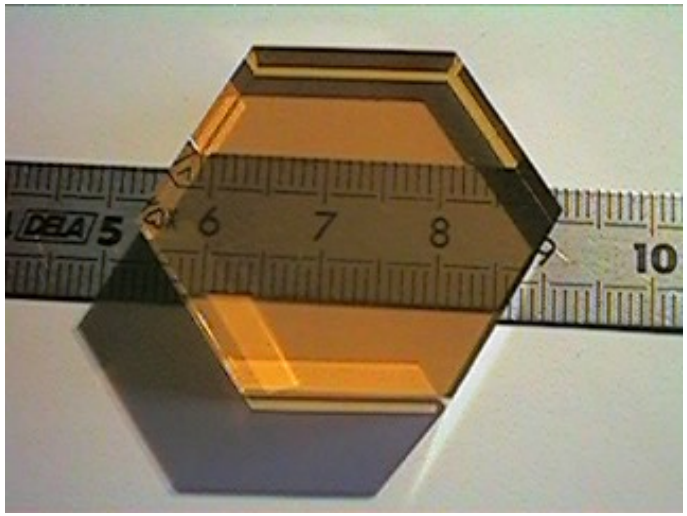






Chalcogenide glass samples





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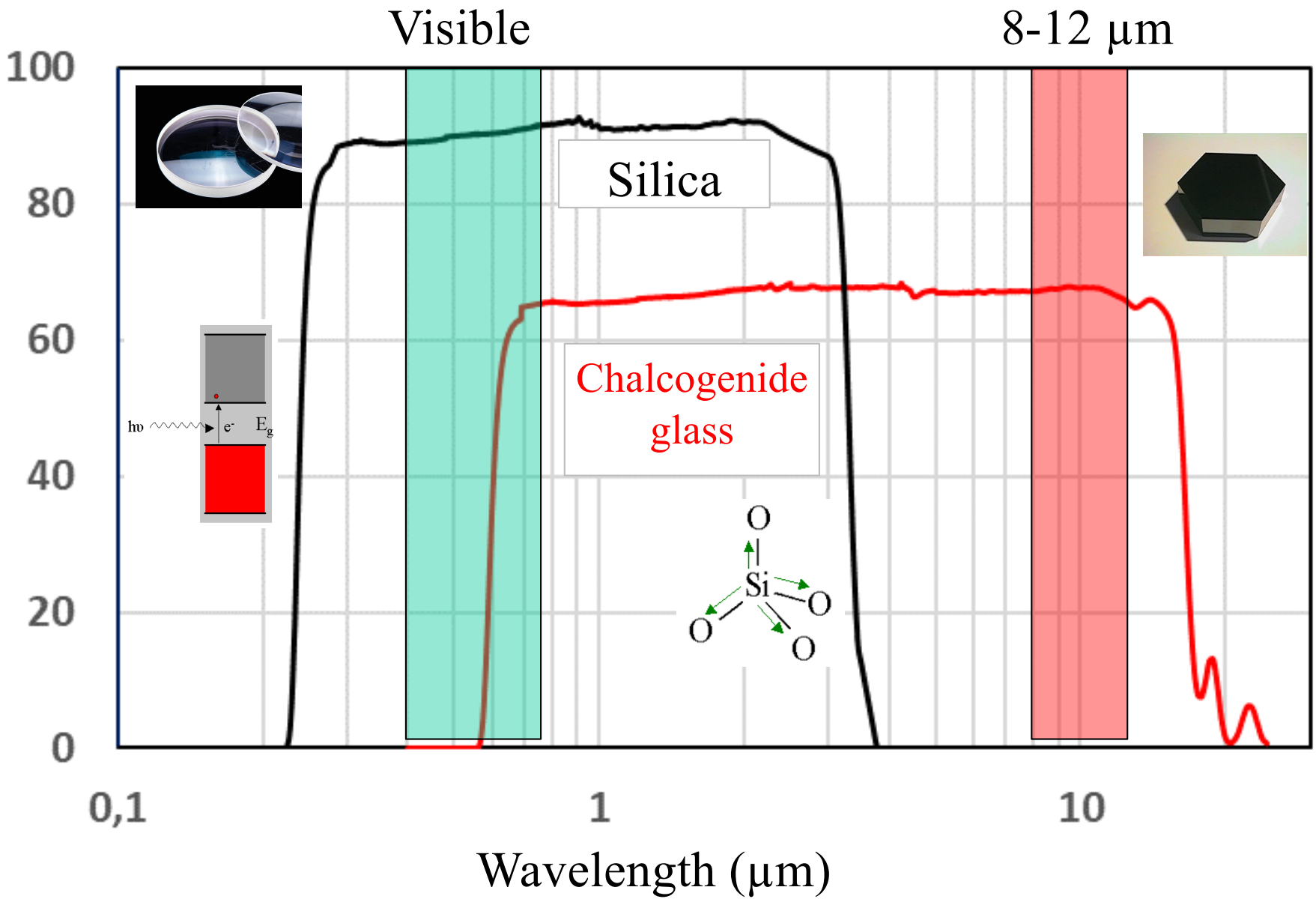
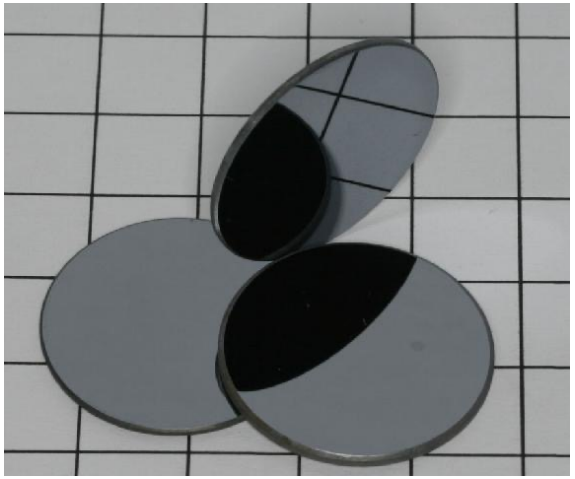
Transmission of different glasses



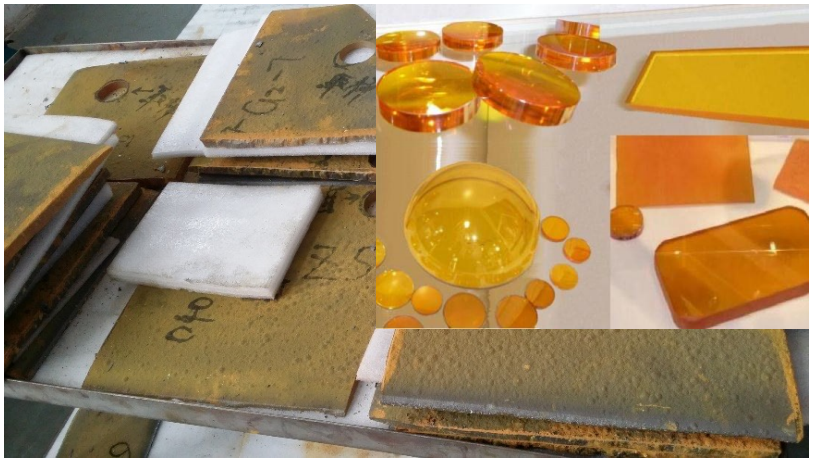
Materials transparent between 8-12 μm

Diamond

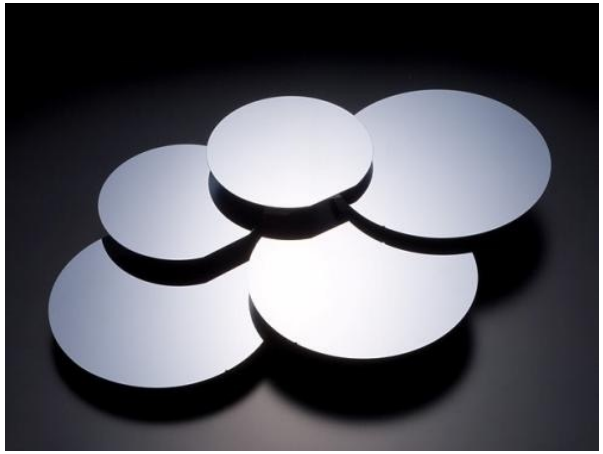
Ge



GaAs



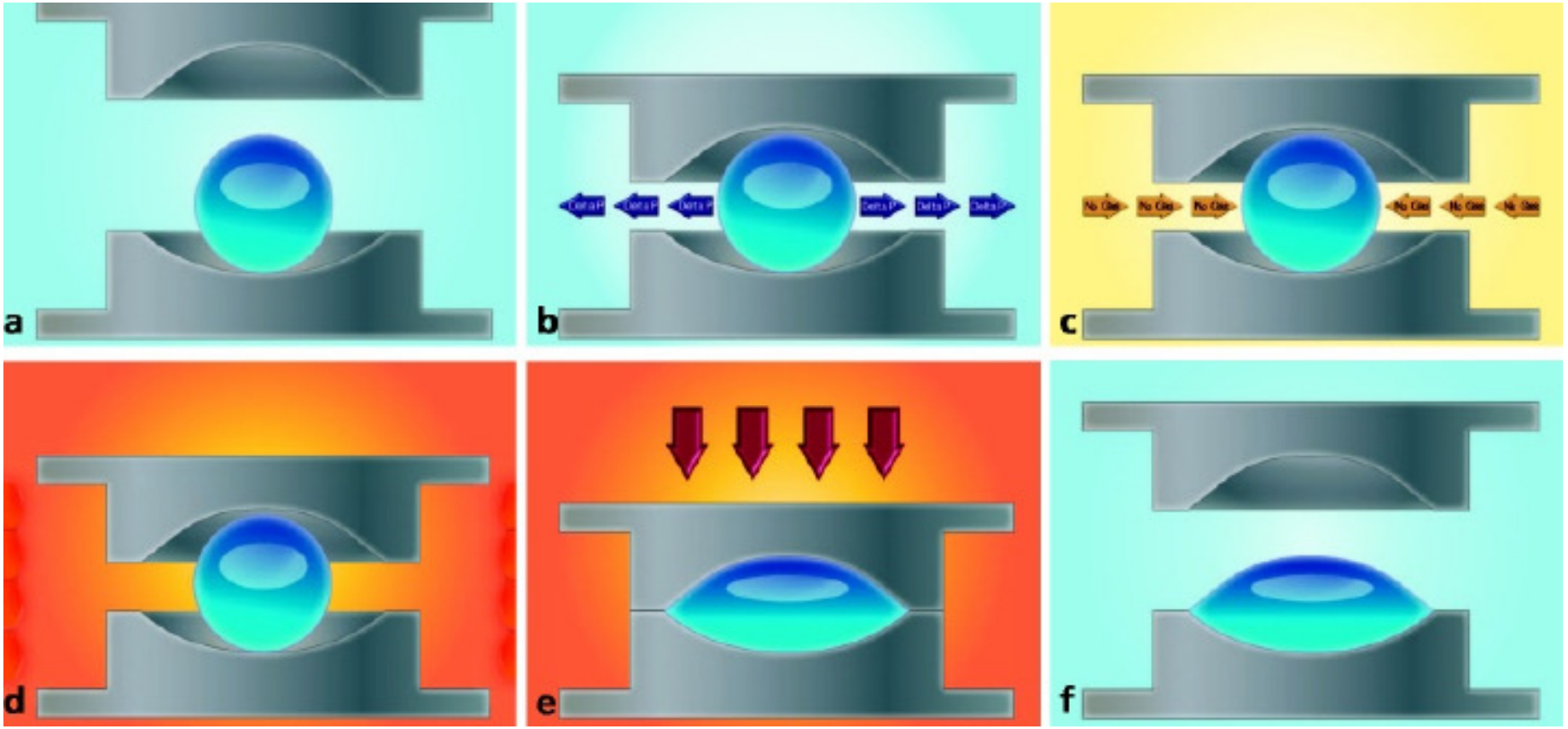
ZnSe



Si

Chalcogenide glass

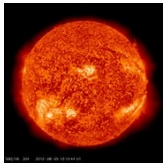
Moulding of infrared glass optics

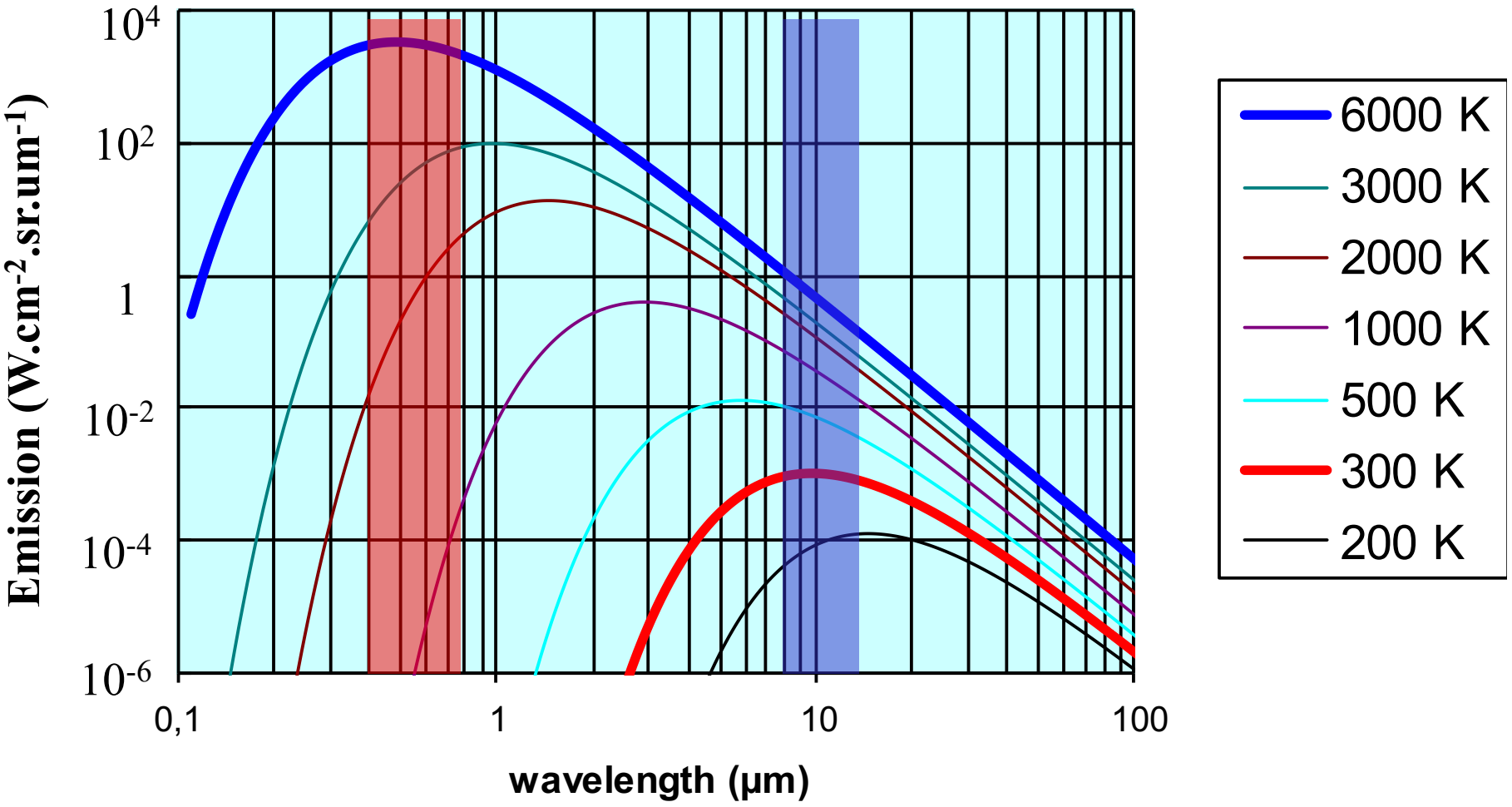


http://www.antekoptics.com

Moulded optics in chalcogenide glasses

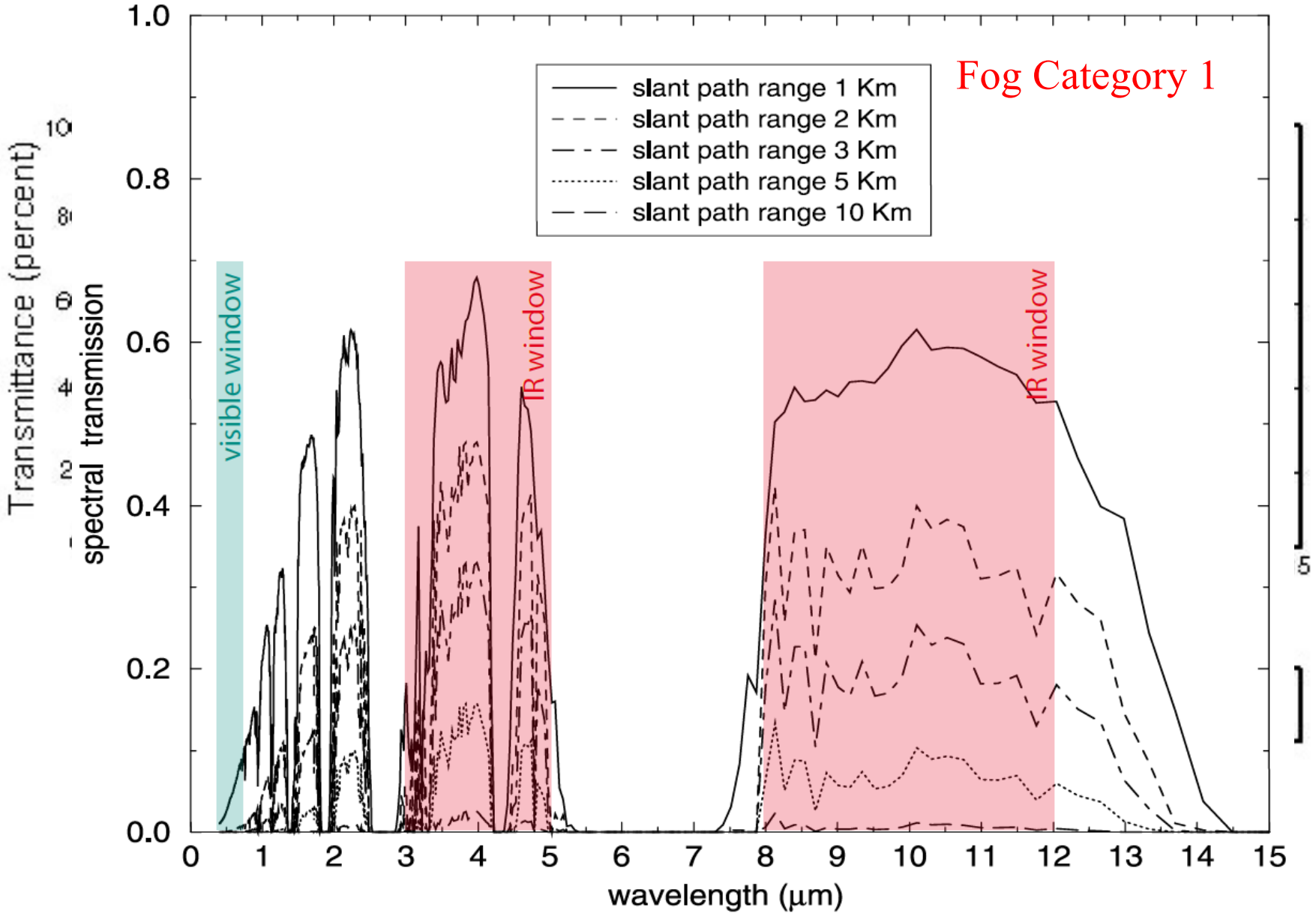
Why 8-12 µm is important





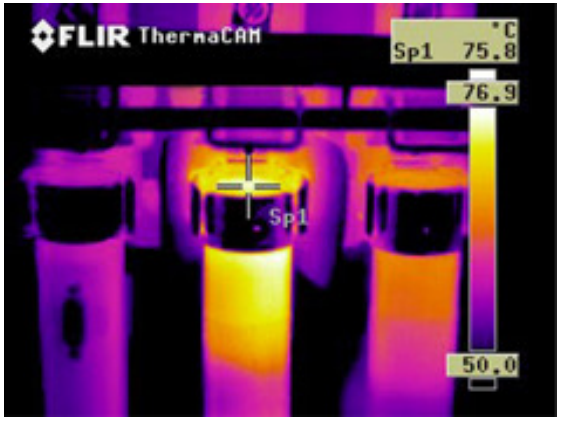
- Visible imaging uses reflection of external light source (sun, lighting…)
- Thermal imaging uses the emission of the objects

The atmosphere should be transparent for imaging



Why infrared is useful

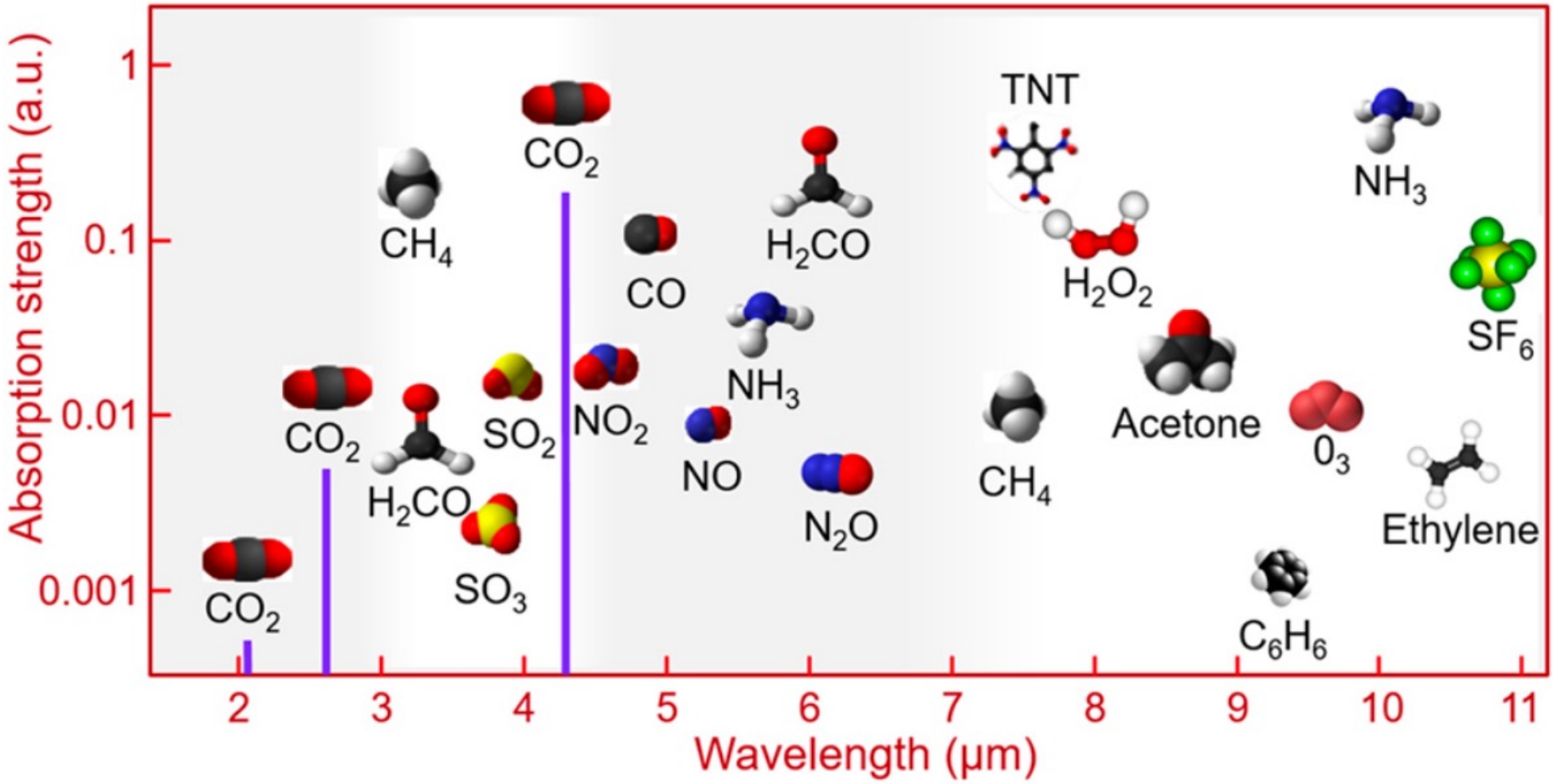
Visible 0.4-0.75 µm



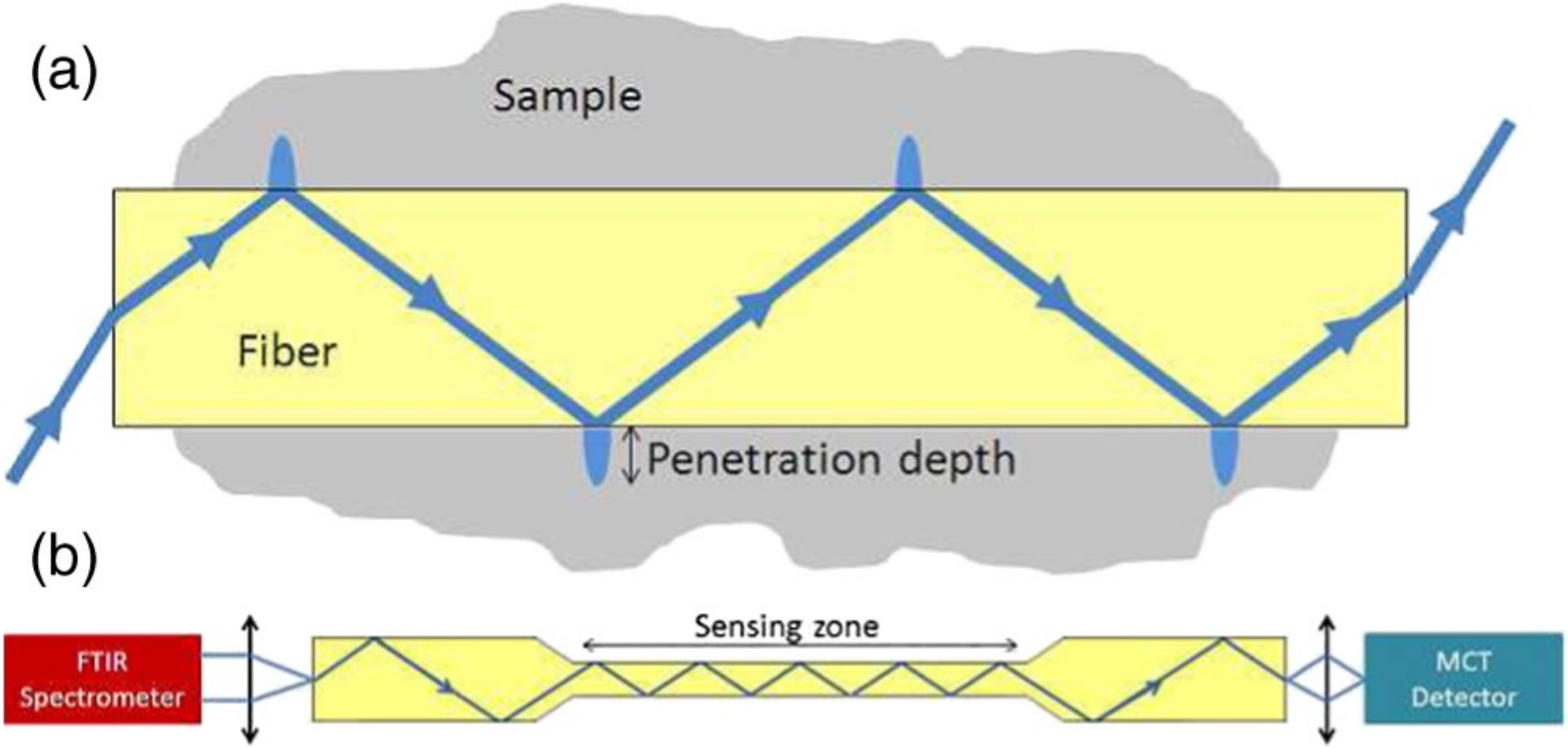
Infrared 8-12 µm

Infrared fibre for chemical sensing

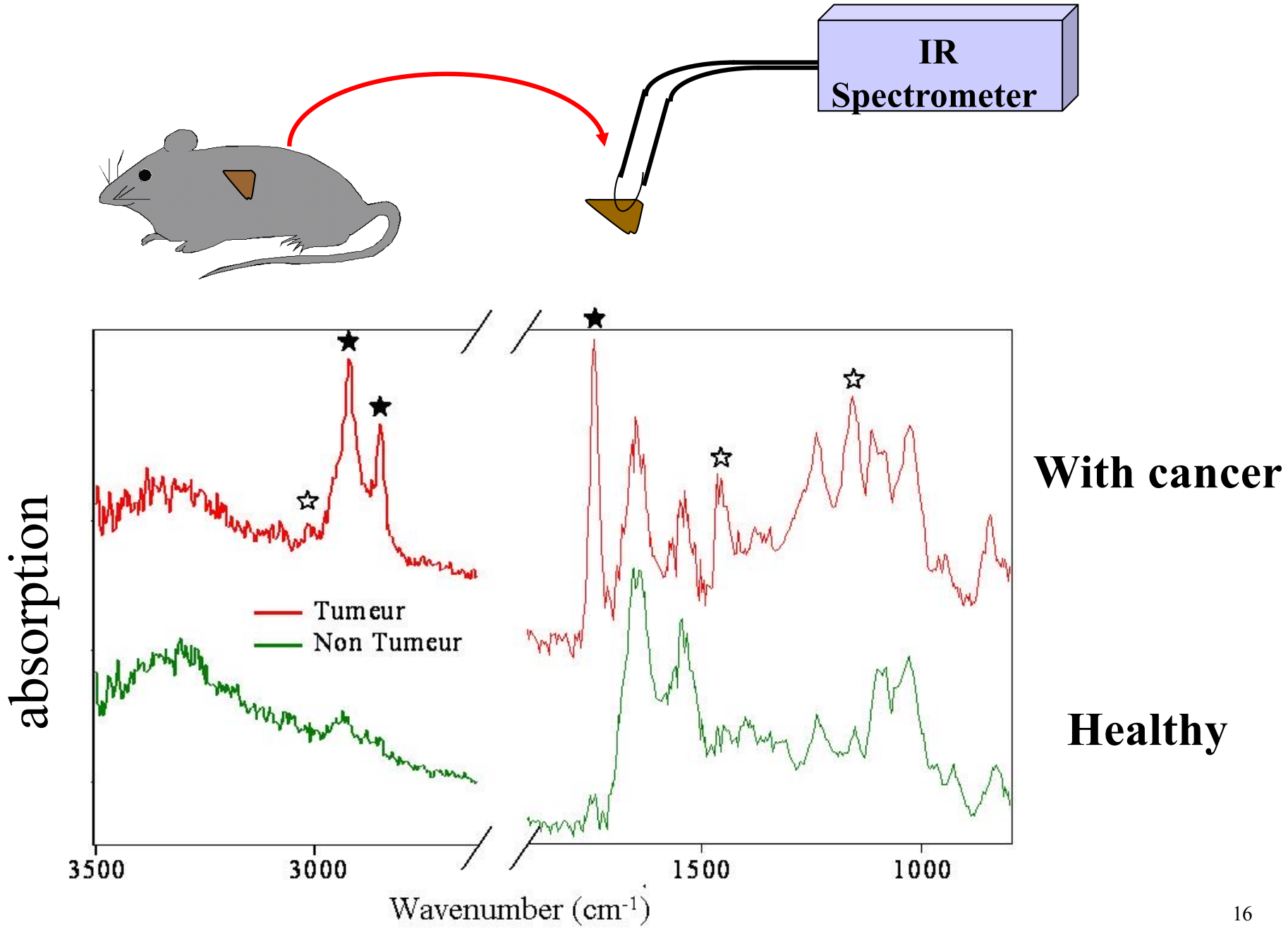
Finger print absorption



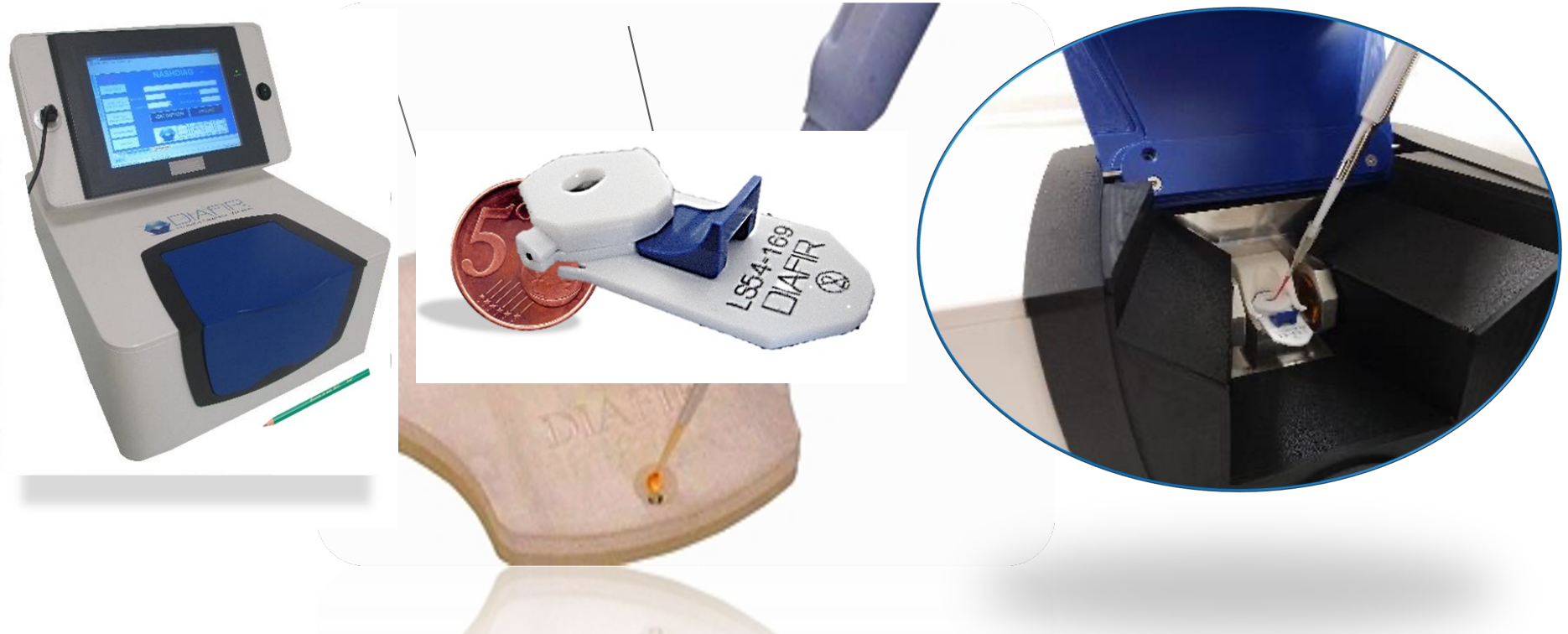
Fiber evanescent wave spectroscopy



chalcogenide glass fibers for biologic sensing



Commercial Products



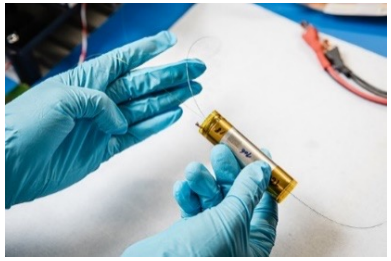
Non alcoholic SteatoHepatitis (NASH): a metabolic liver disease, a complication of Non Alcoholic Fatty Liver Disease

- ✓ Fast measurement (<10 min)
- ✓ Operator independent result
- ✓ Uses only 7µl for minimally invasive procedures

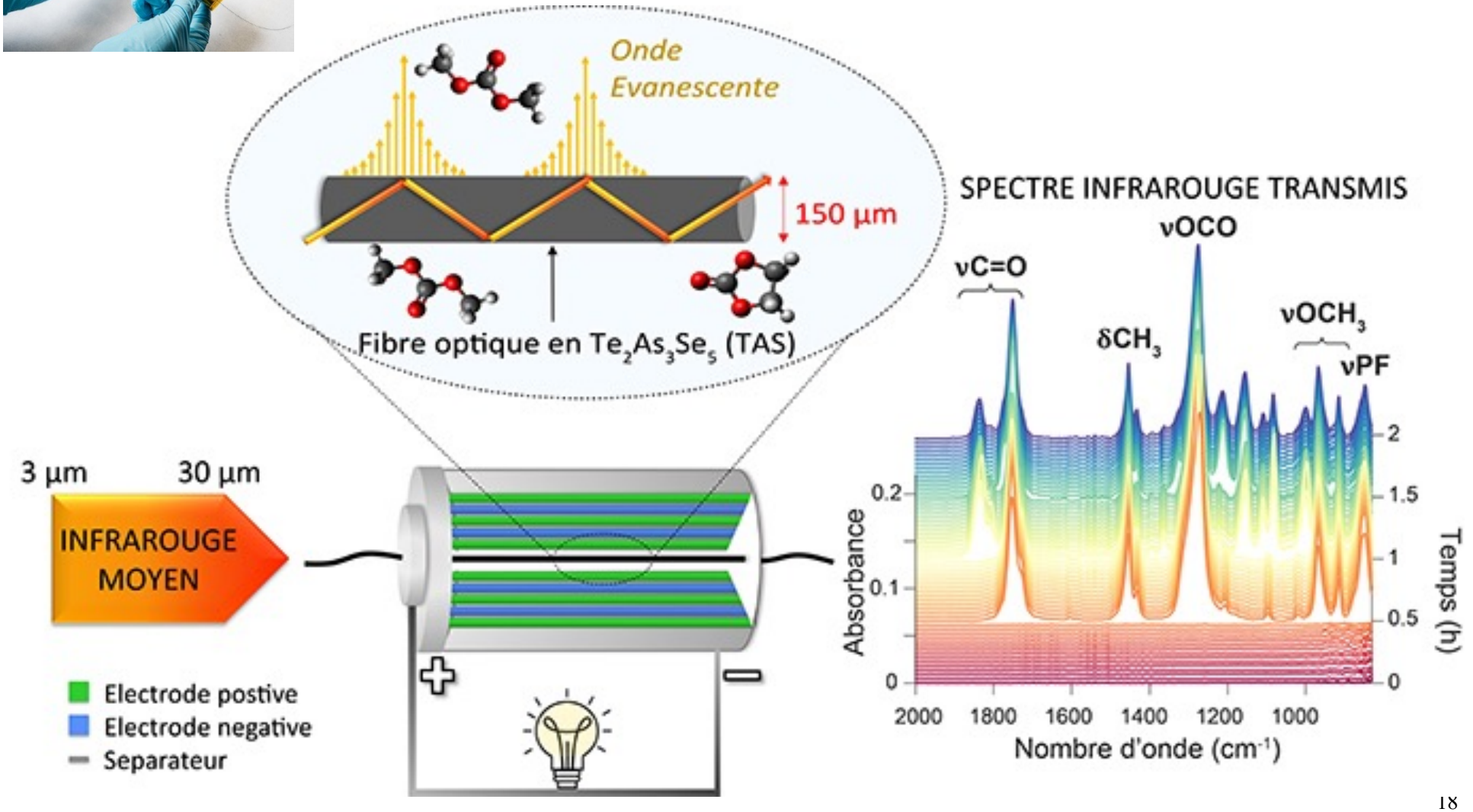
Website: www.diafir.com

DIAFIR Innovative Diagnostic Solutions

Fibre de chalcogénure pour « voir » dans les batteries commerciales



Collaboration groupe du Prof. Tarascon
Nature Energy (2022)



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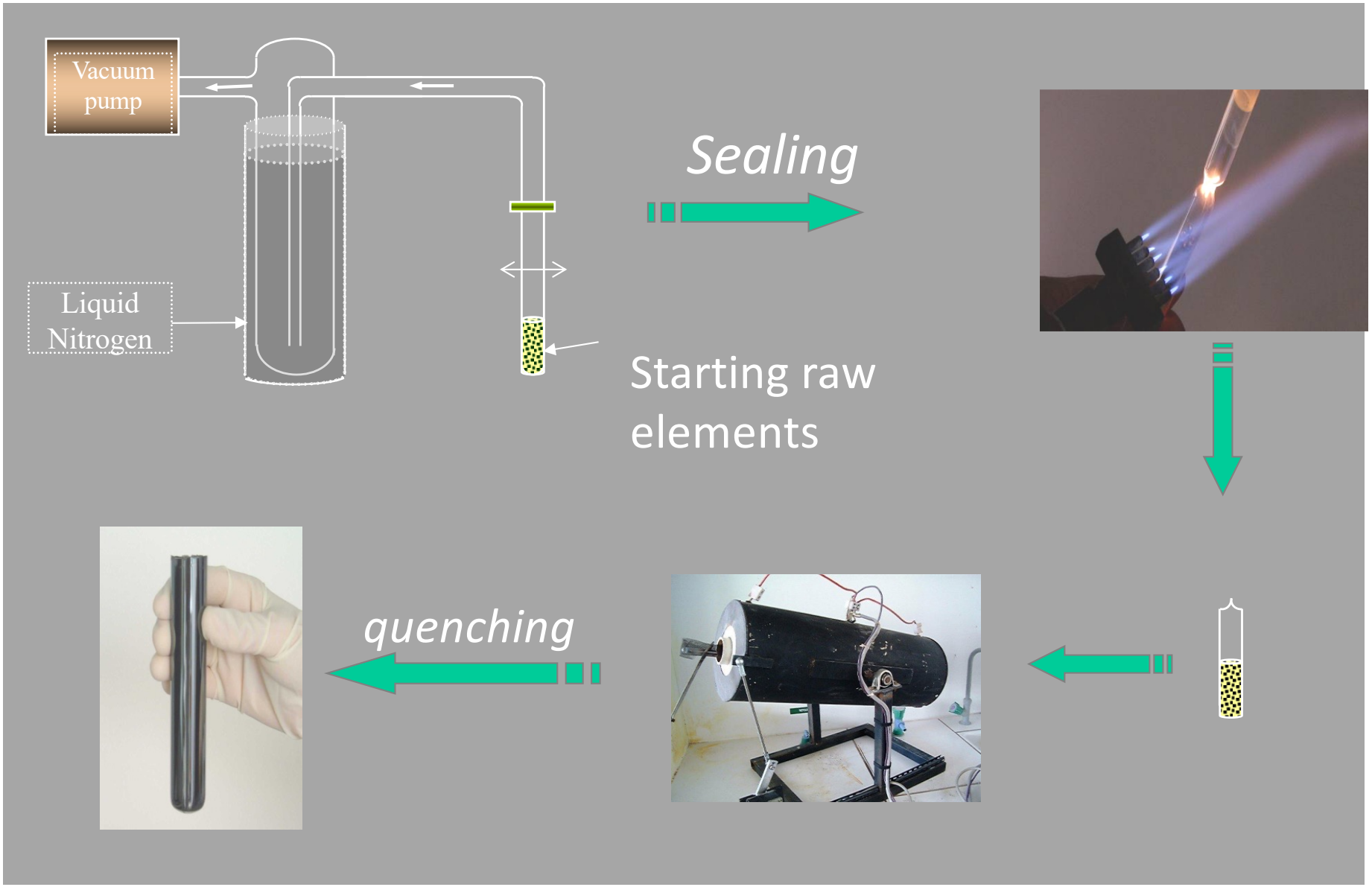
Chalcogenide glass synthesis



Chalcogenide glass industrial production

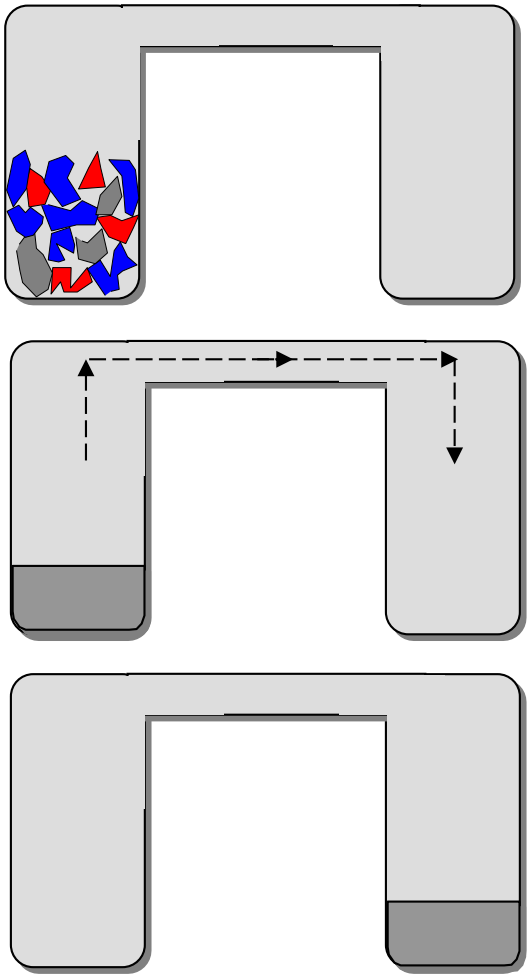
Raw materials, sealed under vacuum

↓

Reaction et distillation

↓

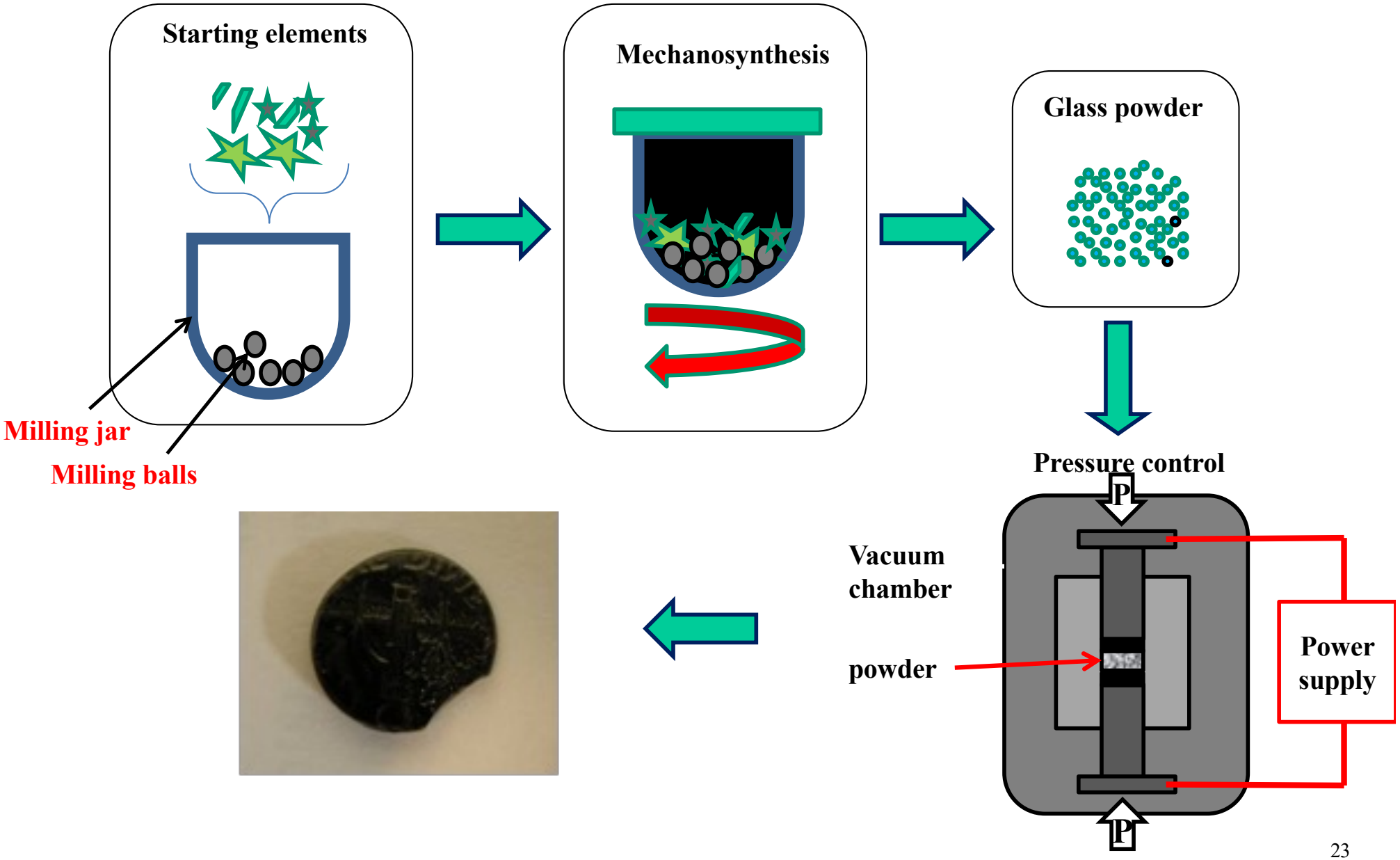
Homogenisation, cooling and annealing



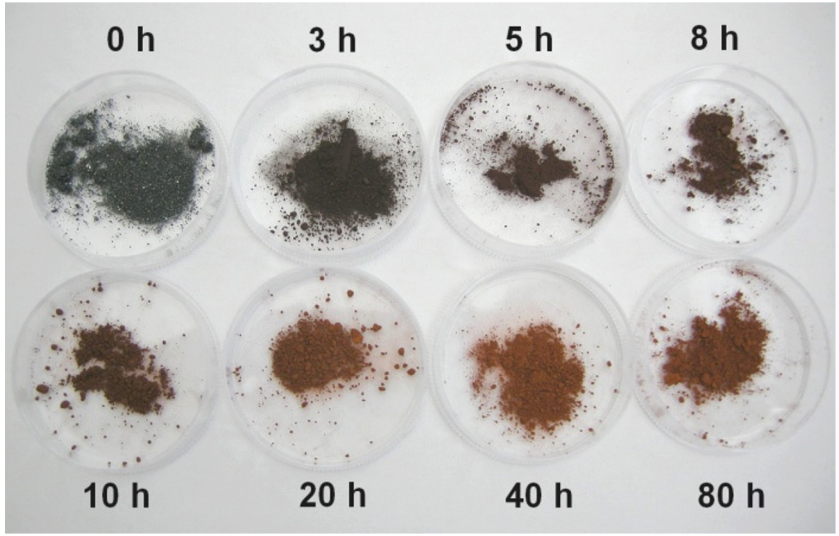
Chalcogenide glass ingots

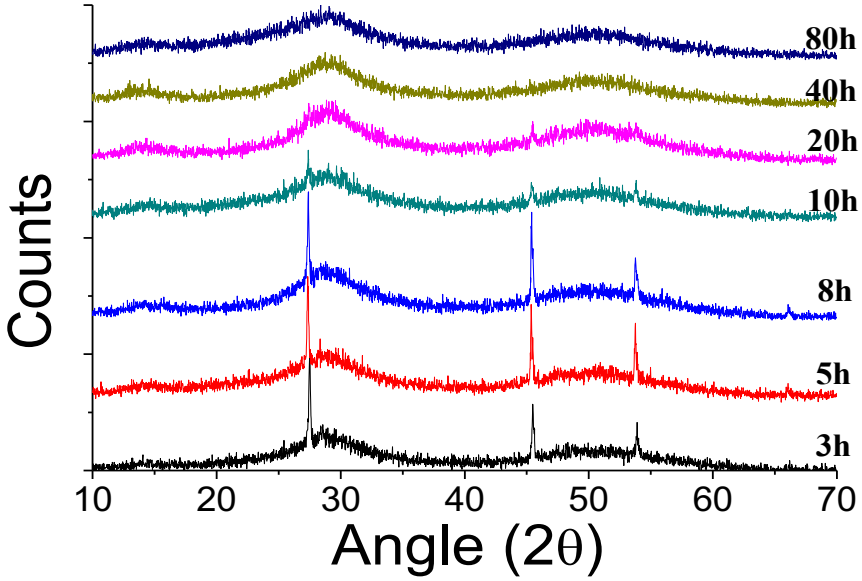
New method for fabricating IR optics

using mechanical energy instead of thermal energy to induce chemical reaction

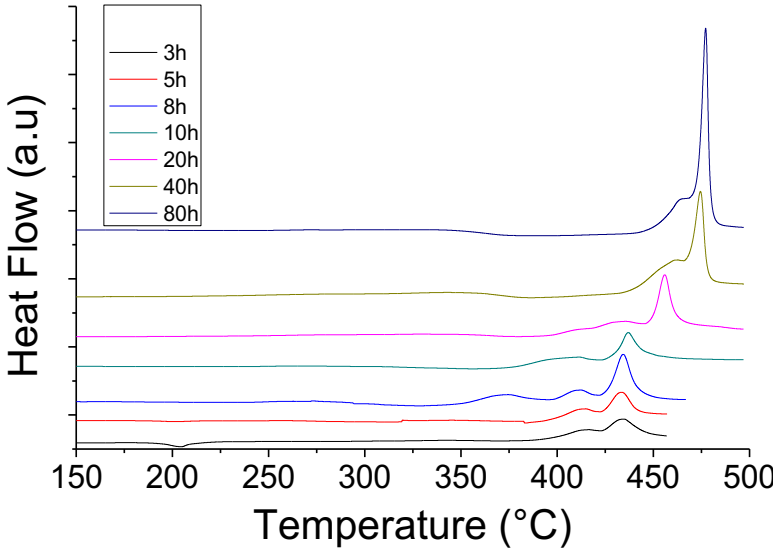


Example of $80GeSe_2$-$20Ga_2Se_3$





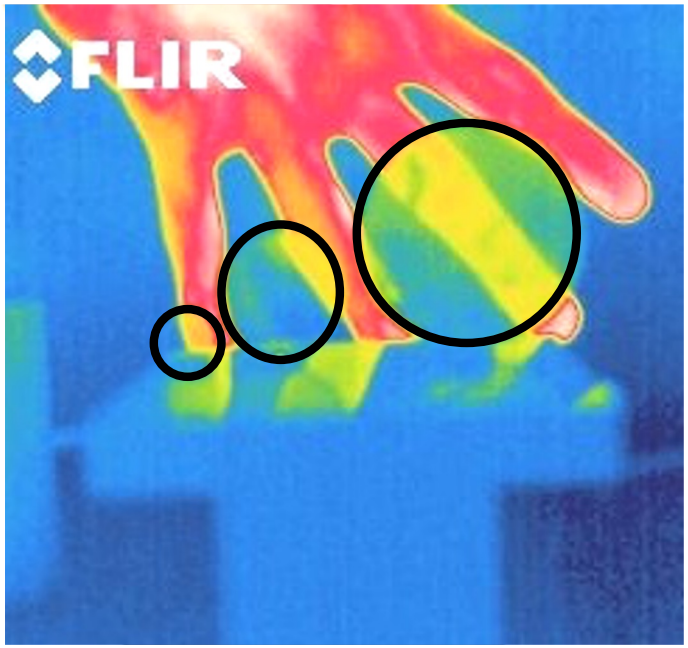
Progressive amorphisation of Ge, Ga, Se



Fast sintered glass from powder

Powder sintered **2 minutes at 390°C** (Tg+40°C), 50MPa

visible



Thermal camera
8-12µm

Densification > 99%

More choice of compositions

Compatible with continuous process

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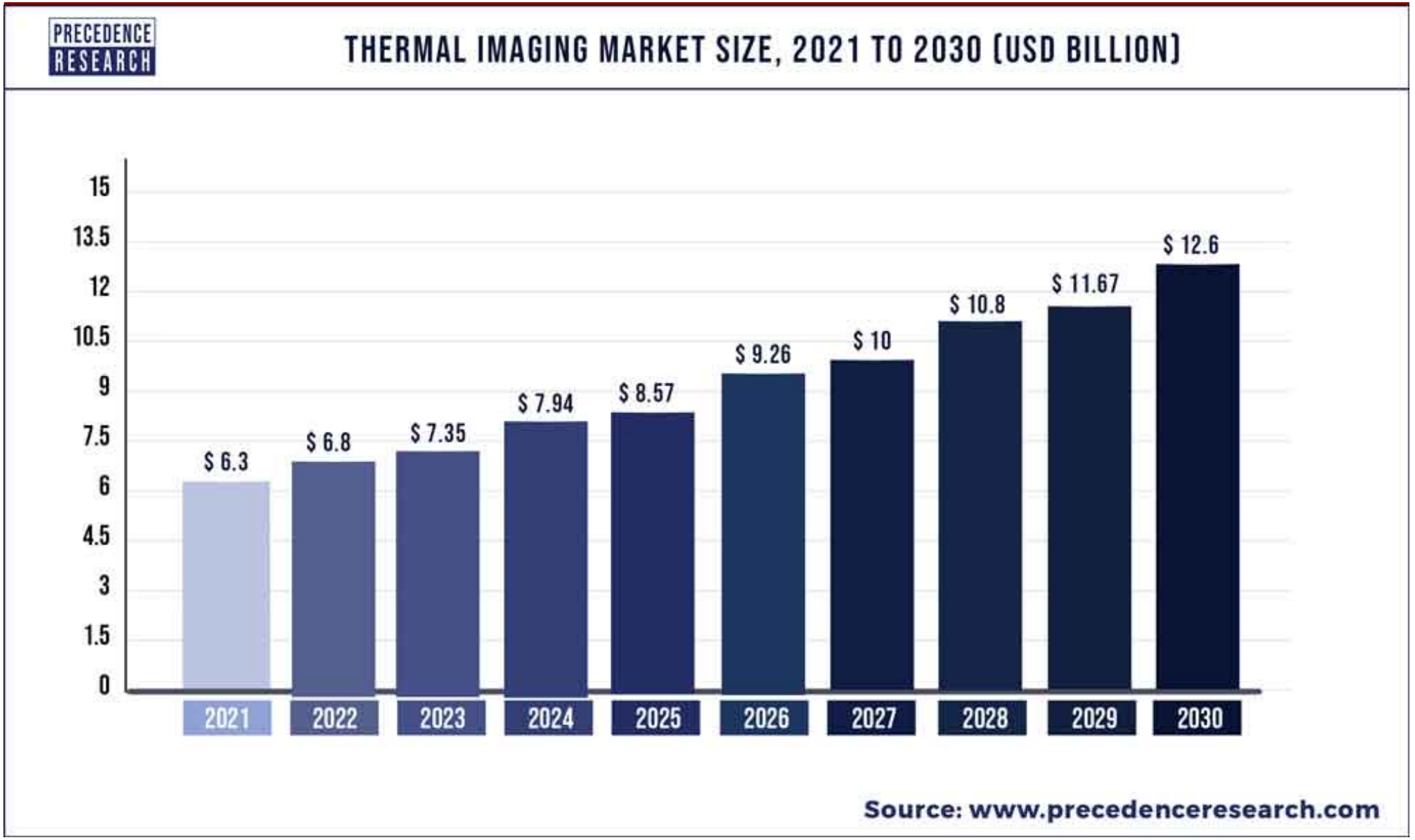
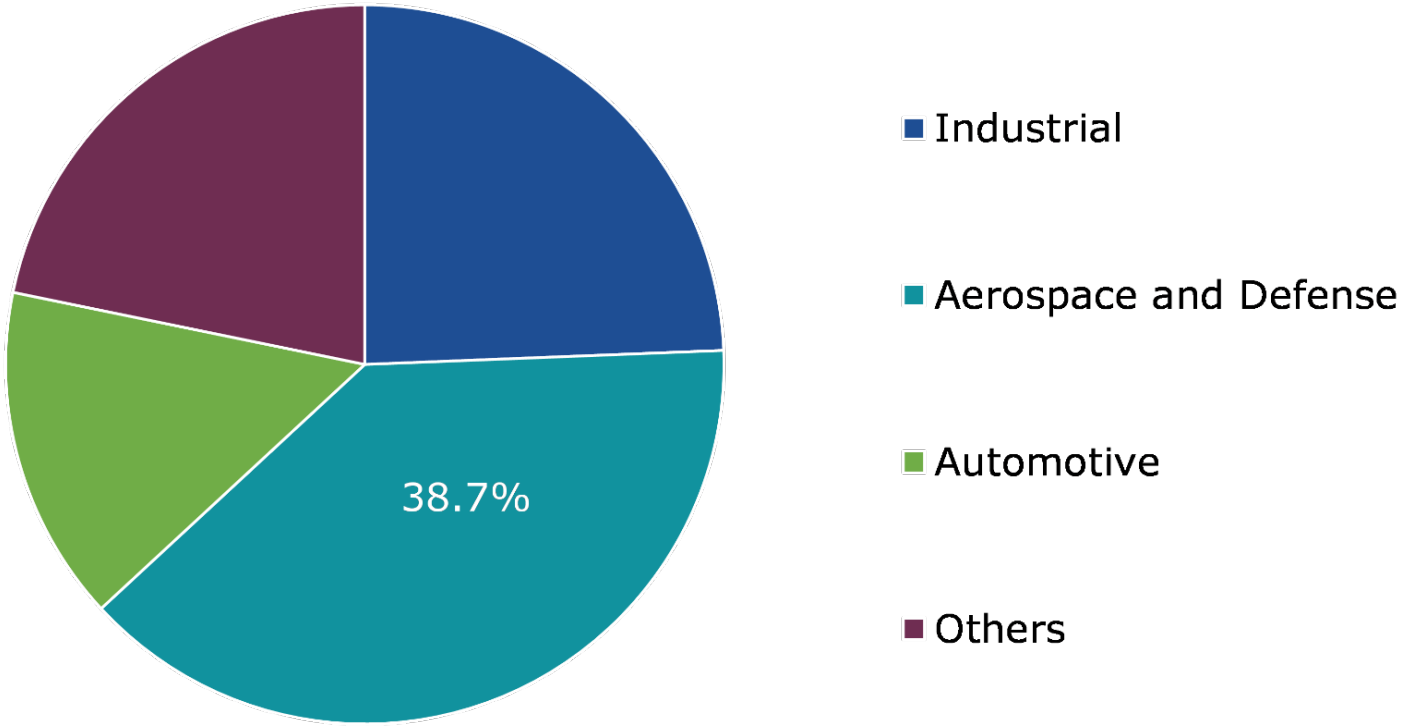
Thermal Imaging – A growing market

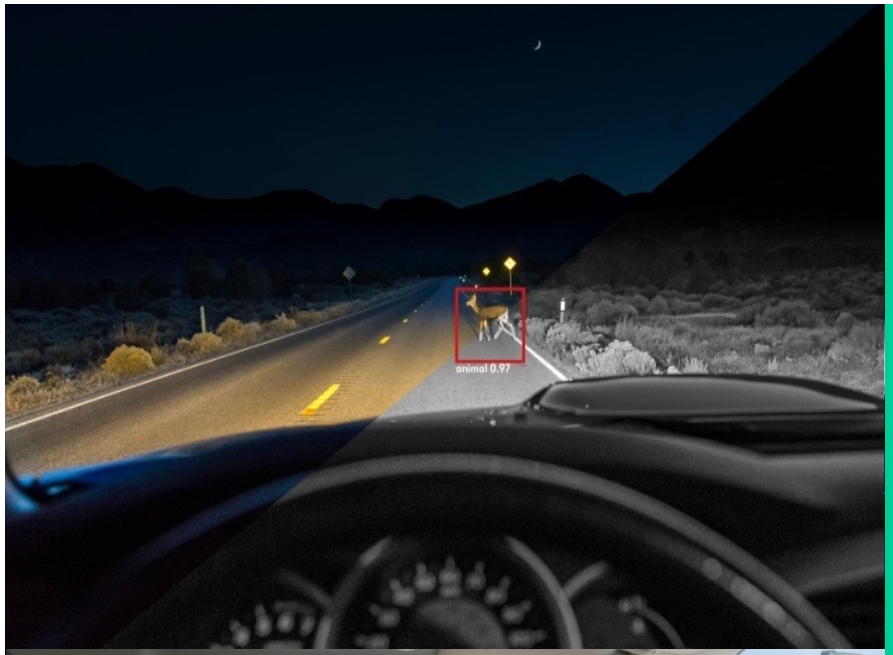


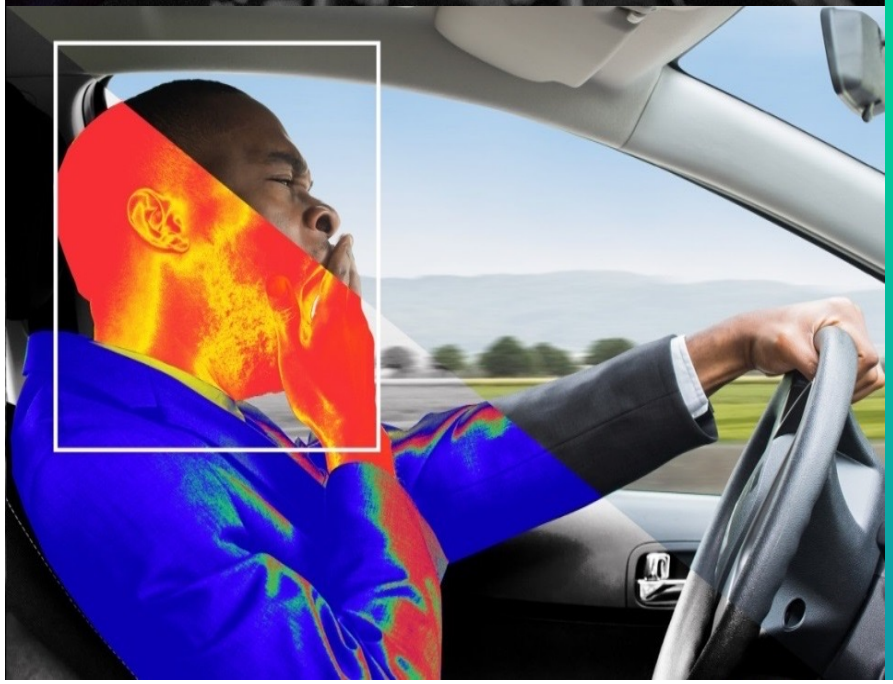
Thermal Camera Market Share, by End-use Industry, 2021



Source: Research Dive Analysis

Advantage of IR camera for driving assistance





HELIAUS

2019-2022

Follow the project on:

www.heliaus.eu

Heliaus thermal vision augmented awarness

ECSEL Joint Undertaking
Electronic Components and Systems for European Leadership

The road to integration into smartphones

(Source: Uncooled Infrared Imaging Technology and Market Trends 2016 report, August 2016, Yole Développement)

STEP I (2014): plug-in

STEP II (2016): Professional smartphone

STEP III: Consumer smartphone with integrated IR

FLIR

Perspectives d'analyses chimiques et biologiques

- L'infrarouge moyen présente des avantages uniques
  - Sélectivité
  - Sensibilité
  - Déportée
- Nombreux besoins plus au moins identifiés/urgents

  - Collaborations avec les utilisateurs
  - Développer des composants appropriés

Résumé

- Qu'est-ce que les verres de chalcogénures?
  - Verres contenant au moins un élément de chalcogène
- A quoi servent ces verres?
  - Application infrarouge au delà de 2 µm
- Que sont les défis actuels
  - Baisser le coût pour application imagerie thermique
  - Développer des solutions d'analyse avec les utilisateurs
- Et les perspectives?
  - Beaucoup d'applications grand public à développer
  - Les composants clés en verre de chalcogénure

Remerciements