

Sensors and laser technologies for food packaging



Gemma García Mandayo
Barcelona 16th May 2019



Non-profit research centre in San Sebastian (Basque Country) Spain

4 RESEARCH AREAS

- MATERIALS AND FABRICATION**
- TRANSPORT AND ENERGY**
- WATER AND HEALTH**
- ICT**



➤ **175** RESEARCH PROJECTS IN 2018
➤ 34 OF H2020, 7 COORDINED BY CEIT

€ **INCOMES**
2018



➤ **250**
PEOPLE



➤ **101**
PHDs



➤ **46**
PHD STUDENTS

Agro-food sensor development

Clean Room Facilities

200 square meters divided into four rooms:

- Packaging area (Class 10.000): Dicing and microwelding.
- Characterization area (Class 10.000): AFM, profilometer, elipsometer.
- Processing area (Class 1.000): PVD and CVD deposition systems, wet and dry etching and micromachining.
- Photolithography area: (Class 100) Lithographic processes, mask alignment.
- Class 10.000 packaging area

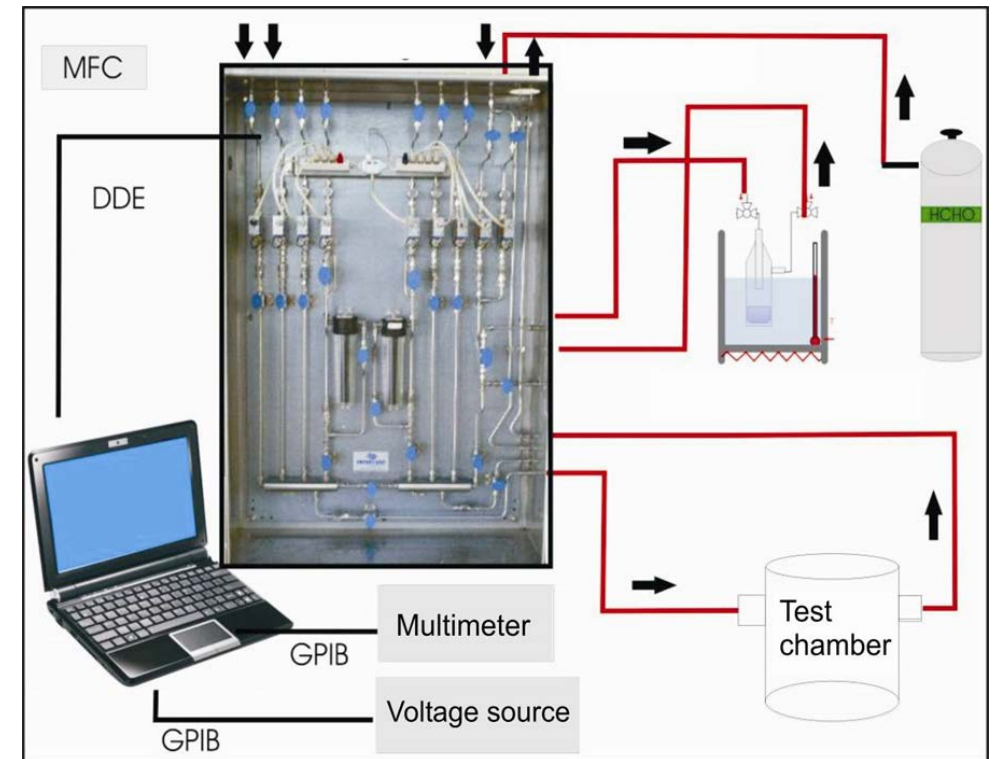


Agro-food sensor development

Characterization lab

4 automated measuring stations with 4/5 Mass Flow Controllers each for controlled gas mixtures and humidity control

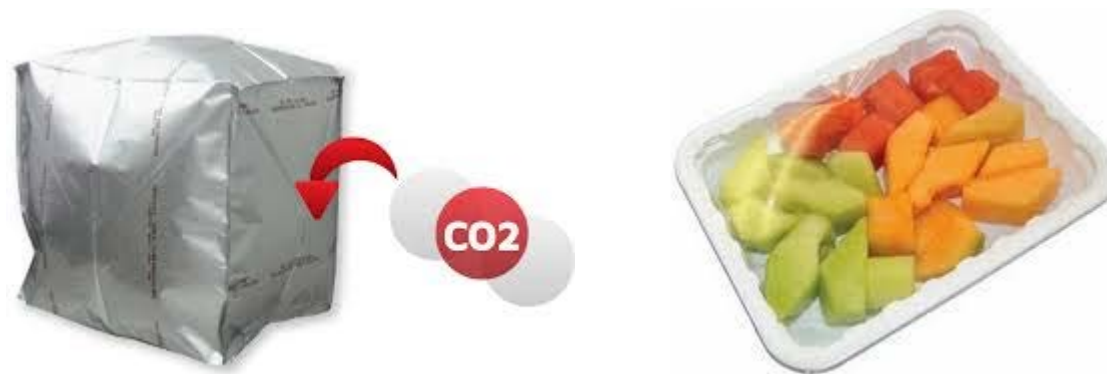
- Conductance/resistance measurements:
 - 11 Keithley 2000 and 2110 multimeters
 - 2 programmable sources AMREL PPS-1326
 - 2 programmable sources Keithley 2200-30-5
 - Climatic chamber DYCOMETAL DL-100/CCM81
 - Vapour generator OWLSTONE OVG-4



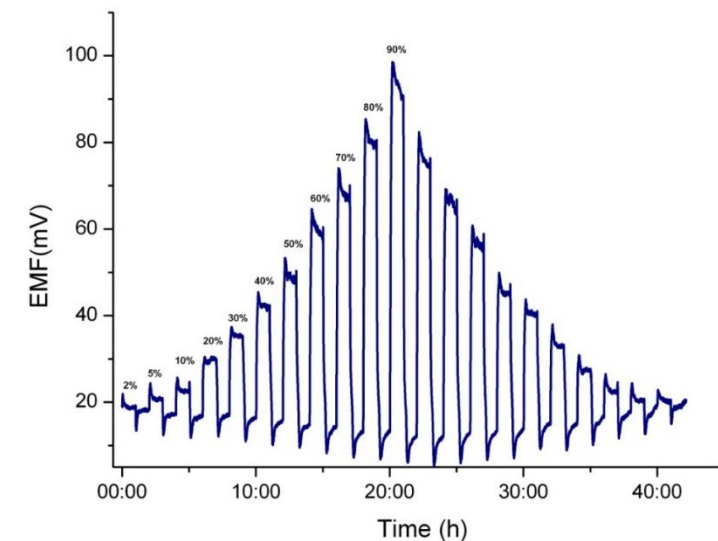
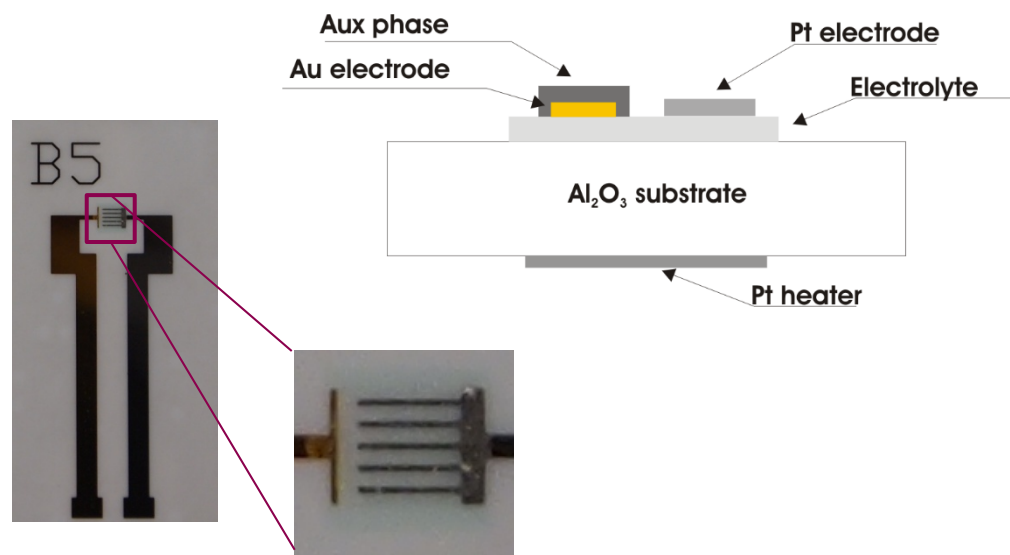
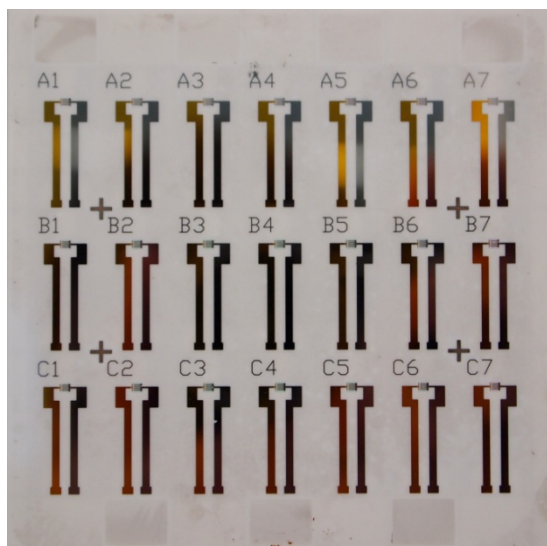
Agro-food sensor development

Electrochemical sensor to detect high concentrations of CO₂

**MODIFIED
ATMOSPHERE
PACKAGING**



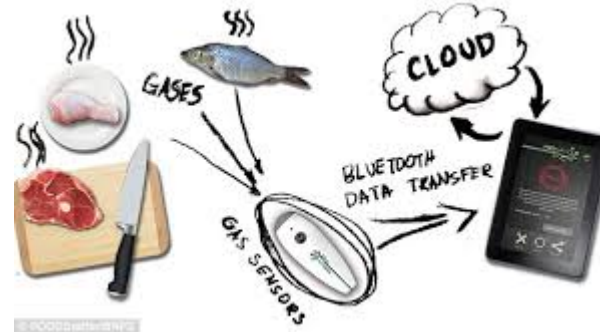
- Low cost
- Wide detection range
- High detection limit



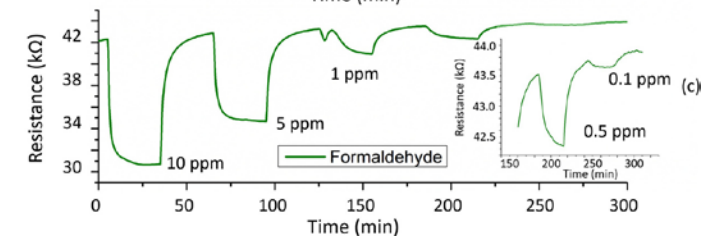
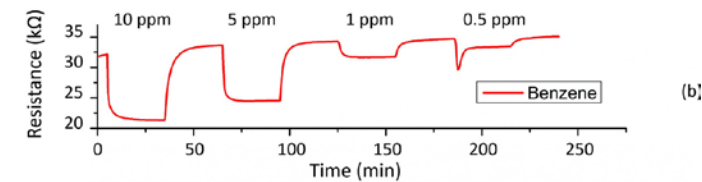
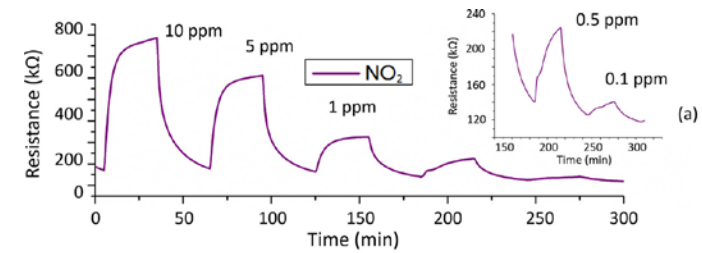
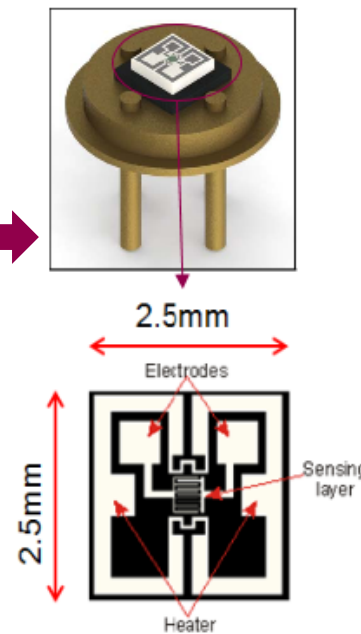
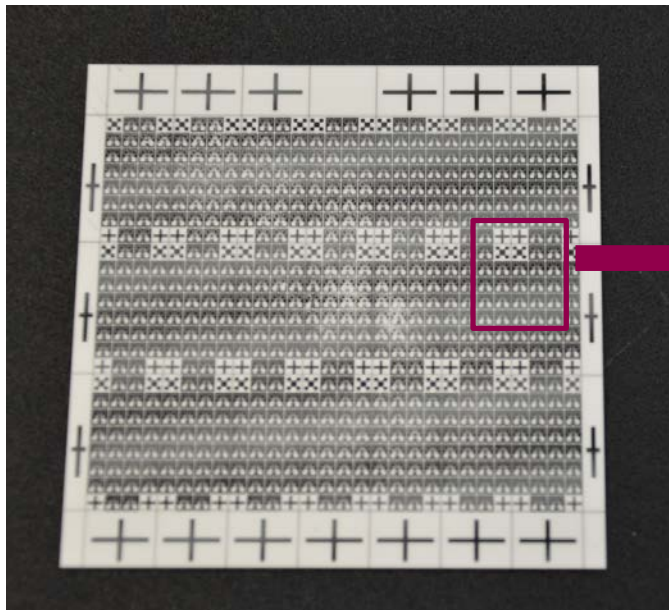
Agro-food sensor development

Conductometric sensors for VOC (Volatile Organic Compound) detection

FOOD FRESHNESS
MONITORING



- Low cost
- Sub-ppm level detection
- High versatility
- Wide range of sensing materials



Agro-food sensor development

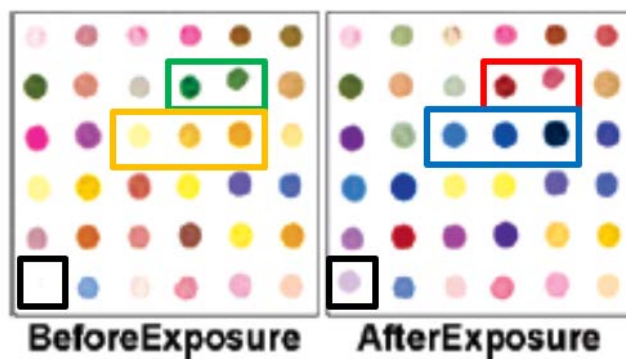
Gasochromic sensors for the analysis of olive oil quality

ANALYSIS OF OLIVE OIL QUALITY

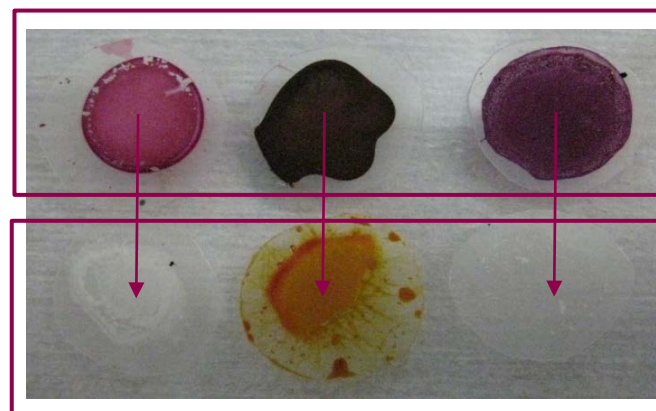


Identification of different type / different quality olive oils

- Detection of counterfeit olive oils
- Evaluation of product ageing



Gasochromic sensors working principle



Before exposure

After exposure

Proprietary functional inks printed on PET substrate

Laser patterning for packaging applications

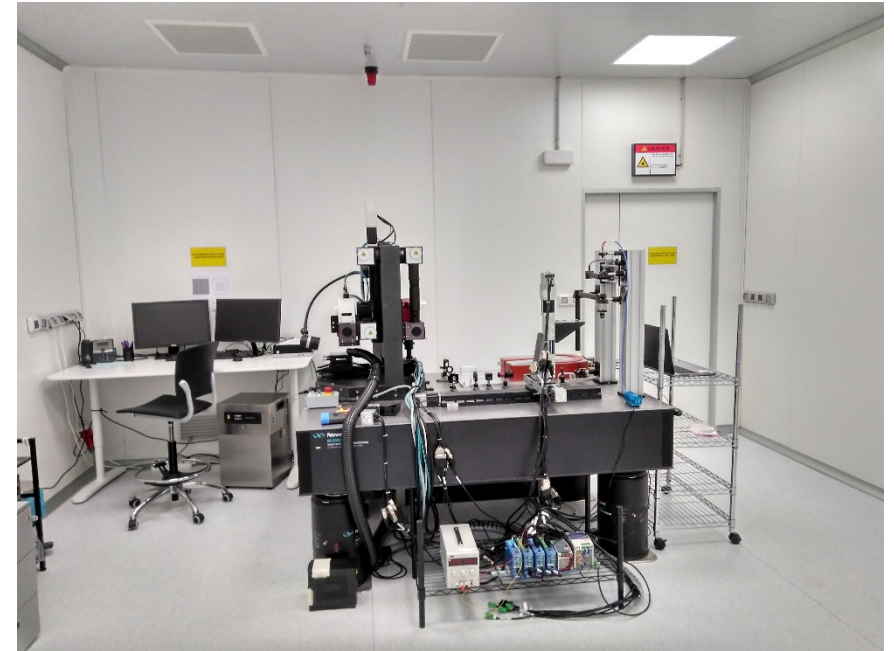
Laser Lab

4 laser labs for process development:

- 2 femtosecond laser sources (Coherent, Amplitude)
- 2 nanosecond laser sources (Innolas)
- 2 xyz microscope beam delivery system
- 1 laser scanner system

1 Optical characterization lab:

- Transmission, reflection and absorption in UV/VIS/IR
- Birrefringence microcope
- Surface characterization: AFM, Confocal



Laser patterning for packaging applications

Direct laser interference patterning (DLIP)

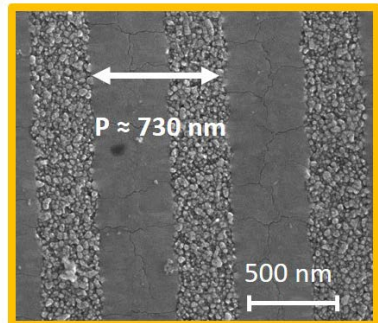
HOLOGRAM SECURITY LABELS



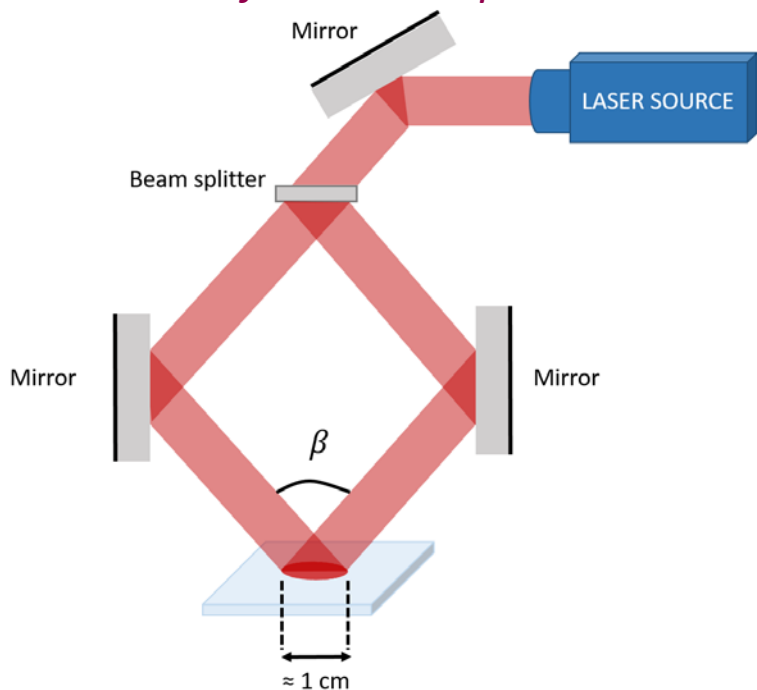
DECORATIVE APPLICATIONS



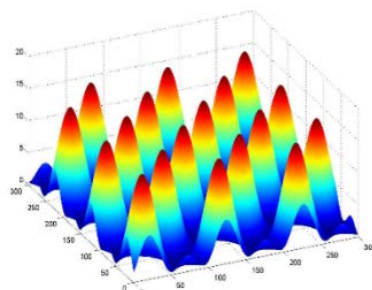
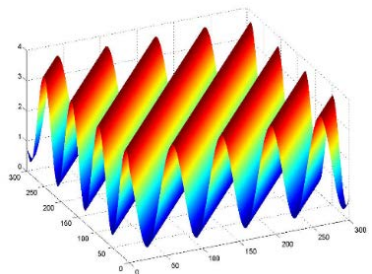
SENSING MATERIAL FUNCTIONALIZATION



Interference setup



Interference patterns

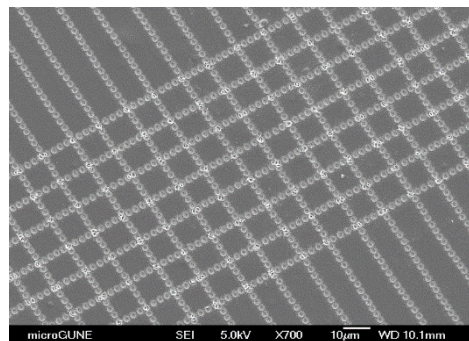


- Fast and maskless process
- Versatile
- Wide range of applications

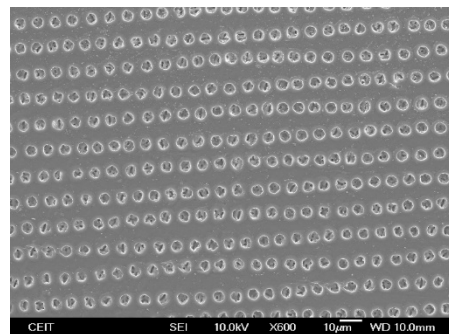
Laser patterning for packaging applications

Femtosecond laser patterning

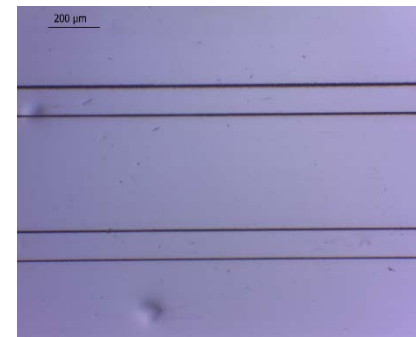
**HIGH RESOLUTION
PROCESSING OF
POLYMER FILMS**



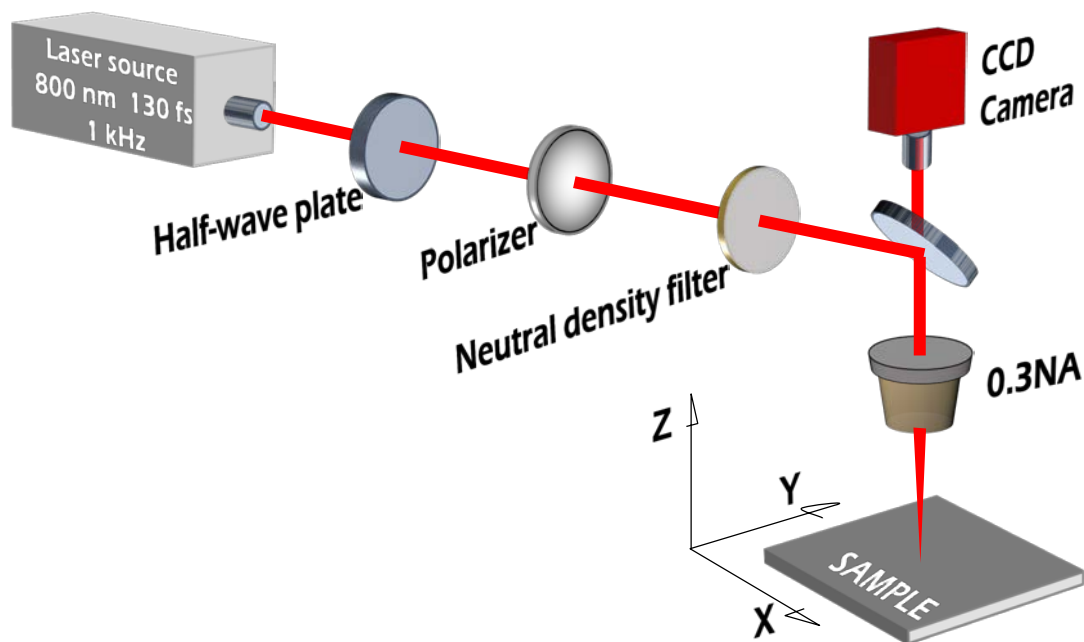
75um Kapton Film



*Biaxially Oriented
Polypropylene (BOPP)*



125um PET Film



- High precision
- Micro-holes for
- Surface texturing



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Gemma García Mandayo

Research Scientist and Project Manager

Advanced Powder Metallurgy and Laser Manufacturing Group

943 212 800 / Ext. 2905

gmandayo@ceit.es