

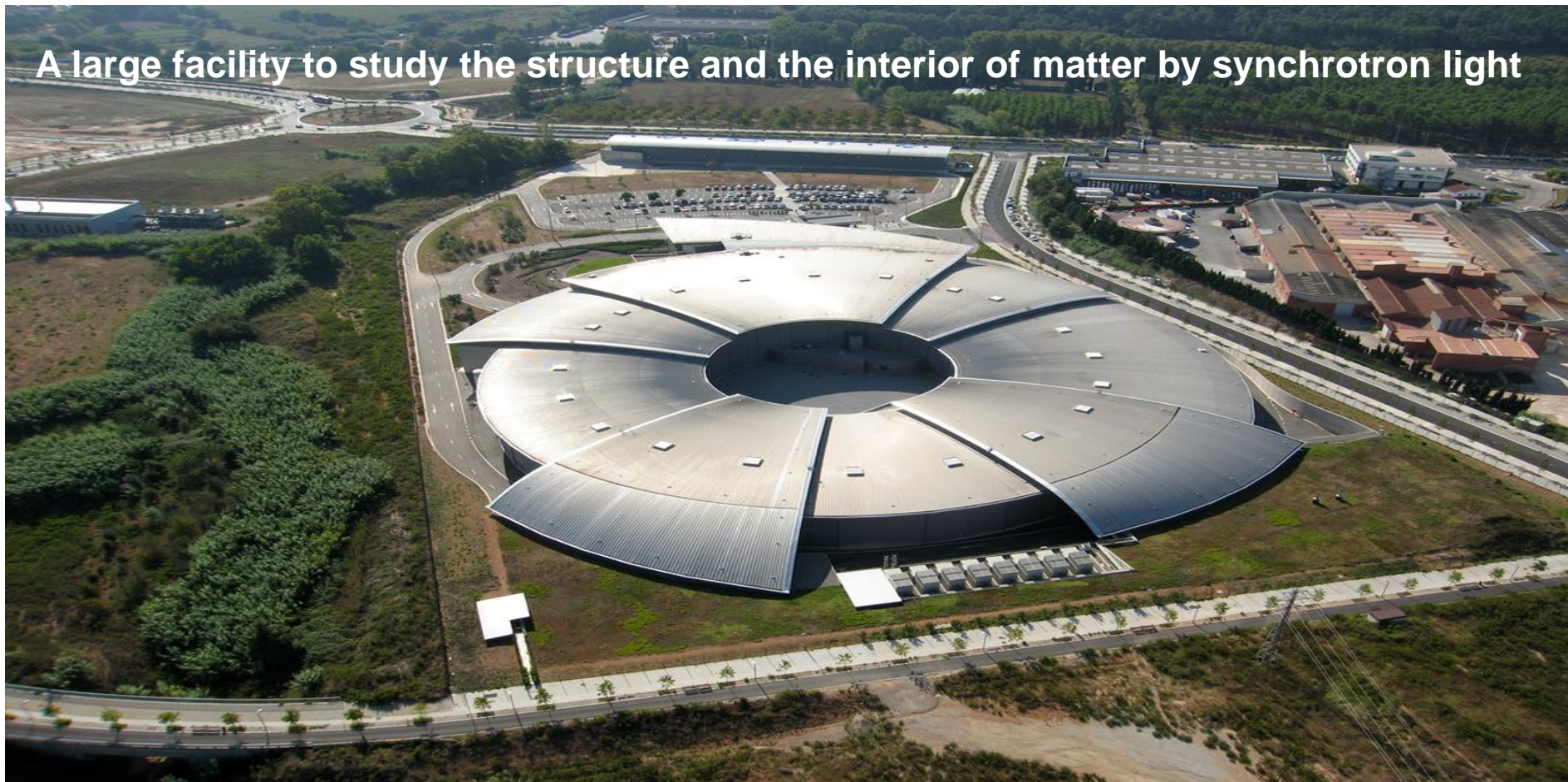


Cómo puede ayudar el Sincrotrón ALBA a la caracterización de fibras textiles



ALBA Synchrotron in short

A large facility to study the structure and the interior of matter by synchrotron light



1st
SCIENCE FACILITY
IN SOUTH-WEST EUROPE

~1500
RESEARCHERS PER YEAR

210 M€
PUBLIC INVESTMENT
(2011)

TOP-NOTCH RESEARCH IN:

- BIOTECHNOLOGY AND LIFE SCIENCES
- CULTURAL HERITAGE
- MICROELECTRONICS AND NANOTECHNOLOGY
- ENVIRONMENT AND ENERGY
- MATERIALS DESIGN, DRUGS AND FOOD

200
STAFF (20% INTERNATIONAL)

~250
EXPERIMENTS PER YEAR

~5000
HOURS PER LAB PER YEAR

ALBA Synchrotron

Chemistry & material science

Life sciences & soft condensed matter

Electronic & magnetic structure of matter

Optics, metrology & support section

BL29: BOREAS
REsonant Absorption and Scattering
ES1: HECTOR ES2: MARES

BL24: CIRCE
Photoemission Spectroscopy and microscopy
ES1: PEEM ES2: NAPP

BL22: CLÆSS
Absorption & Emission Spectroscopies
ES1: XAS ES2: XES

BL20: LOREA (2019)
Low-energy Ultra-high Resolution Angular Photoemission (ARPES)

BL16: NOTOS (2020)
XAS, HRPD, Instrumental development

BL13: XALOC
Macromolecular Cristallography

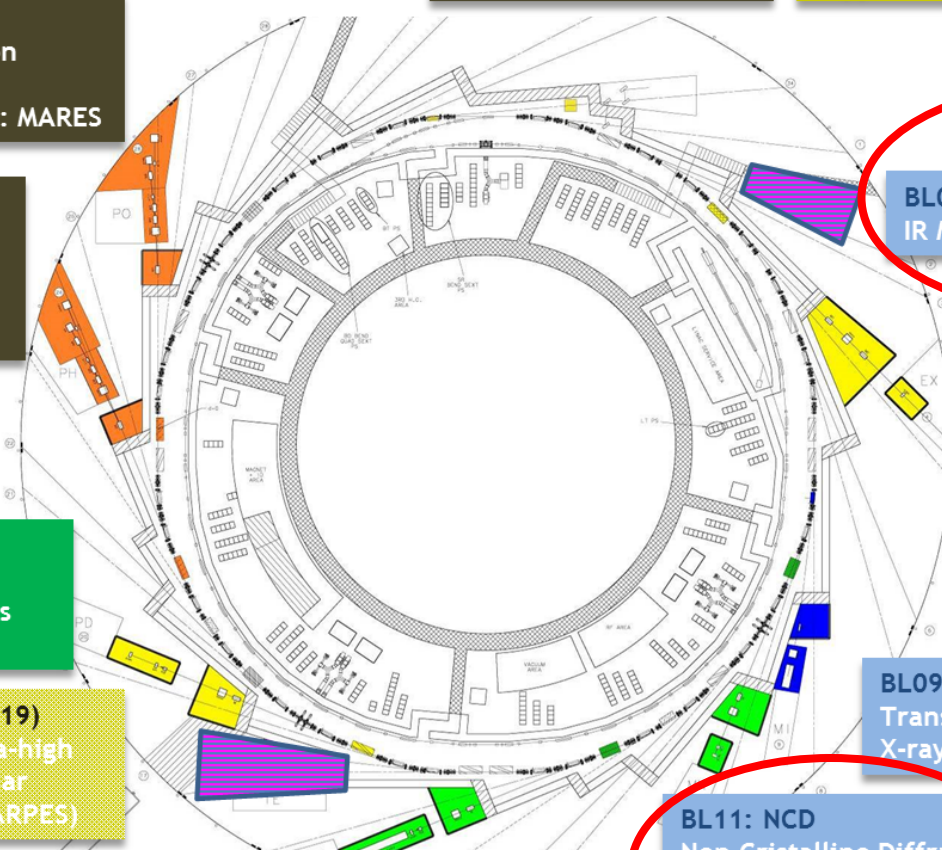
BL11: NCD
Non Cristalline Diffraction SAXS/WAXS

BL09: MISTRAL
Transmission soft X-ray microscopy

BL06: XAIRA (2020)
Microfocus macromolecular crystallography

BL04: MSPD
Materials Science and Powder Diffraction
ES1: HRPD ES2: HP

BL01: MIRAS
IR Microspectroscopy



TEXTILE

WHY DO COMPANIES USE ALBA SYNCHROTRON ?



LOWER DETECTION LEVELS



CHEMICAL MAPPING



OXIDATION STATE DETERMINATION



HIGHER RESOLUTION



FASTER EXPERIMENTS



WIDE VARIETY OF SAMPLES
ENVIRONMENTS

Synchrotron and textile- STRUCTURE

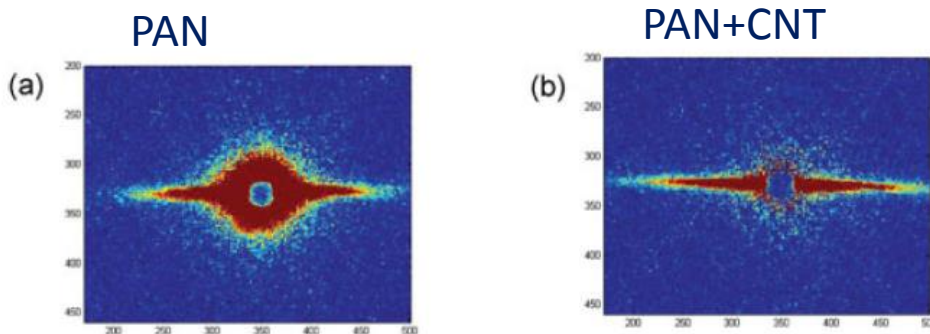
SAXS-WAXS: Small and Wide X-Ray Angle Scattering

- ✓ **STRUCTURE OF THE INNER OF FIBRES:**
 - WAXS: molecular level
 - SAXS: larger scales (10-100nm)
- ✓ **STRUCTURE VS MACROSCOPIC PROPERTIES**
- ✓ **STRUCTURAL CHANGES IN SITU (deformation, T^o, etc.)**



Polyacrylonitrile (PAN) Fibers reinforced with Carbon Nanotubes (CNTs)

Reinforcement: interaction between PAN and CNTs



Changes in the scattering → Mechanical properties

- With and without CNT
- Elongation
- Temperature

Wang et al, 2009 "Small-Angle X-Ray Scattering Investigation of Carbon Nanotube-Reinforced Polyacrylonitrile Fibers During Deformation"

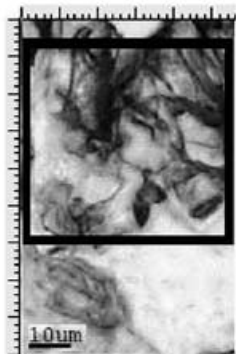
Synchrotron and textile- DEGRADATION

FTIR: Infrared Microspectroscopy

- ✓ DEGRADATION OF TEXTILE FIBRES
- ✓ MAPPING OF COMPOUNDS IN A SELECTED AREA
- ✓ HIGH SPATIAL RESOLUTION USING SYNCHROTRON IR
- ✓ HIGHER BAND RESOLUTION USING SYNCHROTRON IR



Study of biodegraded historical textiles (Hemp, Flax, Cotton)

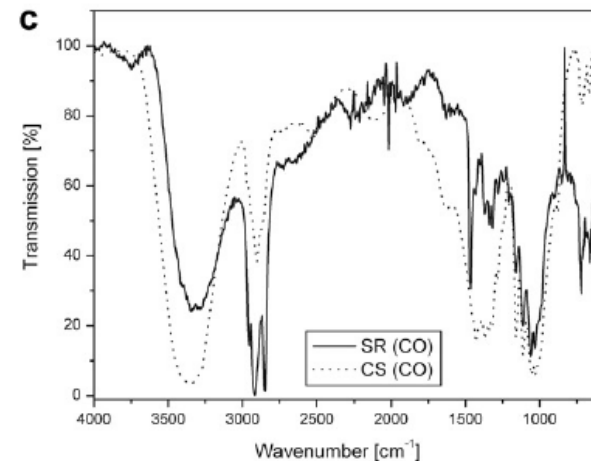


Determine the presence of different materials in cross sections as an indicator of degradation

Information for conservation actions

Synchrotron IR: mapping images and higher resolution of bands

Synchrotron vs conventional IR



Kavkler et al, 2011 "Investigation of biodeteriorated historical textiles by conventional and synchrotron radiation FTIR spectroscopy"



Thank you for your attention !