



New routes for the conservation of films and other artefacts based on cellulose derivatives

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The need

► The facts:

- A huge percentage of the recent European cultural heritage (CH) can be found in movies, photographs, posters and slides produced between 1895 to nowadays were made using cellulose derivatives.
- Cinematographic works are an essential component of our cultural heritage and identities and therefore deserve full protection. In addition to their cultural value, cinematographic works are a source of historical background on the evolution of European society. They provide a comprehensive record of the richness of Europe's cultural identities and the diversity of its people.
- In order to ensure that European film heritage is passed down intact to future generations, it has to be systematically collected, catalogued, preserved and restored.



The need

► The facts:

- The worldwide estimation of such holdings within professional film archives is around 18 Mio of film reels on cellulose acetate, whereof ca. 5% are in a critical stage or showing signs of *vinegar syndrome*.
- Conservators consider two approaches when planning treatments to extend the useful lifetime of cultural materials: preventive or passive and active or interventive. But in case of cellulose derivatives and other components of the movie or photos, once initiated, degradation cannot be prevented, reversed or stopped, but only inhibited or slowed.
- There have had other technical approaches to solve this real problem that follow the line of replication and copy the original ones in modern digital supports but, they do not give the possibility of a real preservation of the original ones.





► The Key Objectives:

- NEMOSINE aims to improve the traditional storage solutions, by developing an innovative smart package with the main goal of energy saving and extent conservation time of cultural objects based on cellulose derivatives.
- Compensate the lack of cool and freeze storage for cellulose based Cultural Heritage materials
- Increase life expectancy of cultural heritage objects when storage conditions are insufficient (too warm, too humid)
- Monitor systematically the chemical condition of the cultural objects
- Precise knowledge of the conditions of the collections
- Develop a prediction model for deterioration



NEMOSINE CONCEPT

- ▶ NEMOSINE improves the traditional storage solutions, such as freeze storage (below 5°C), by developing an innovative package with the main goal of energy saving and extent conservation time.
- ▶ The SMART PACKAGE concept:
 - ▶ All the individual elements will be integrated in a smart package depending on the CH artefact deterioration grade and other requirements for protective or curative purposes.



ACTIVE ACID
ADSORBERS



GAS
DETECTION
SENSORS



MULTI-SCALE
MODELLING



PACKAGING
WITH MODULAR
DESIGN



CURATIVE
PACKAGES

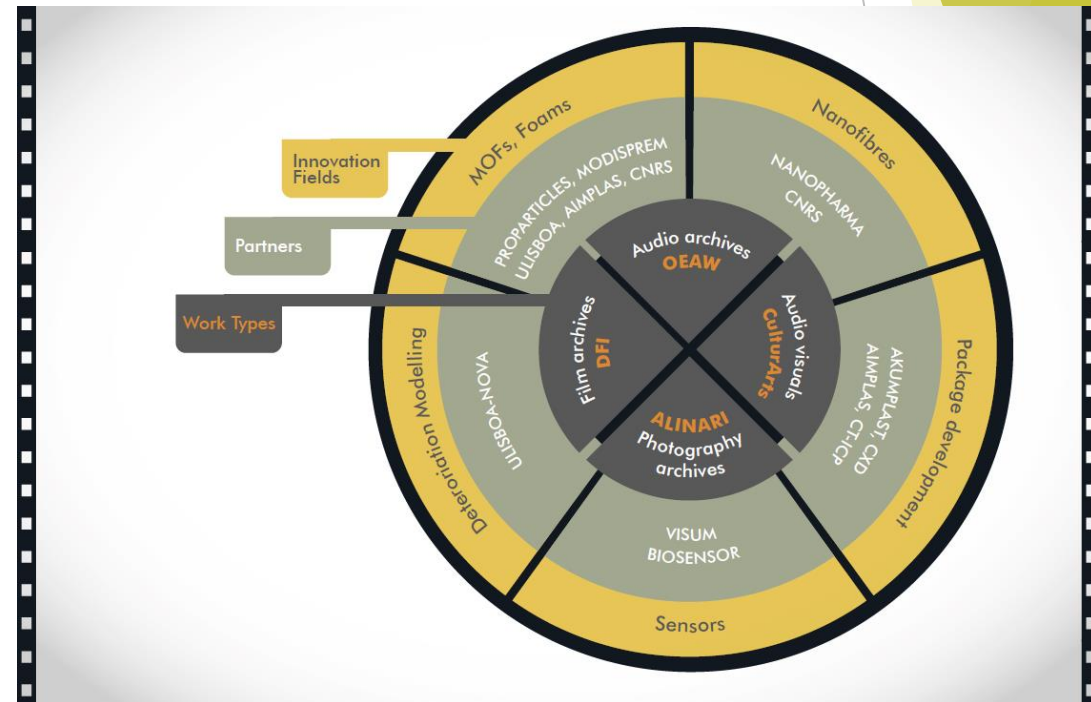


NEMOSINE PARTNERSHIP

► The Partnership composition:

- The presence of main actors in the whole value chain demonstrates the critical mass of complimentary resources that will enable the NEMOSINE project to achieve its targeted societal, industrial, and scientific breakthroughs and commercial success.

- **RTD partners:** AIMPLAS, CNRS, IST, NOVA, IPC and OEAW
- **SME partners:** PROM, AKUMPLAST, BIOSENSOR, IRIS, NPH, MODISPREM, PNO, BESKIDPLUS
- **IND partner:** CXD
- **SSH institutions:** OEAW, CulturArts, DFF, ALINARI



Technical approach

- LCA
- LCC
- LCSA

Environmental,
regulatory &
economic analyses

MOF AA
Absorber

AA absorber and
antifungal
integration

- Foams
- Nanofibers
- Cryogels
- Cellulose membranes

Package
integration and
Final Demonstrator

Sensors & Wireless
control

- NO_x
- AA sensor
- Electronics
- Data communication

- Material selection
- Packaging Design
- Packaging Production
- Integration and Final Demonstrator

Degradation model
software

- Data acquisition
- Data management
- Film monitoring



Technical approach

**MOF AA
Absorber**

AA absorber and
antifungal
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Sensors & Wireless
control

Degradation model
software

Package integration
and Final
Demonstrator

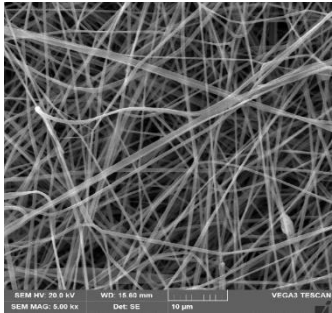


Technical approach



AA absorber and antifungal integration technical approach

PVB nanofibers



PU foam



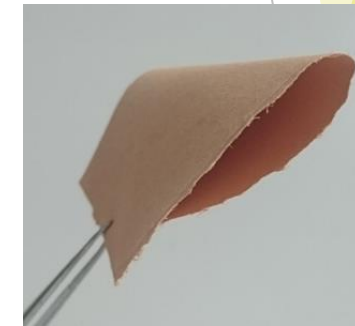
Nanocellulose foams



Impregnated "in situ" PP foam



Cellulose membranes



woven non woven



Foams



Paper



Technical approach

MOF AA Absorber

AA absorber and
antifungal
integration

**Sensors & Wireless
control**

Degradation model
software

Package integration
and Final
Demonstrator



NOx sensor



AA sensor

Technical approach

MOF AA Absorber

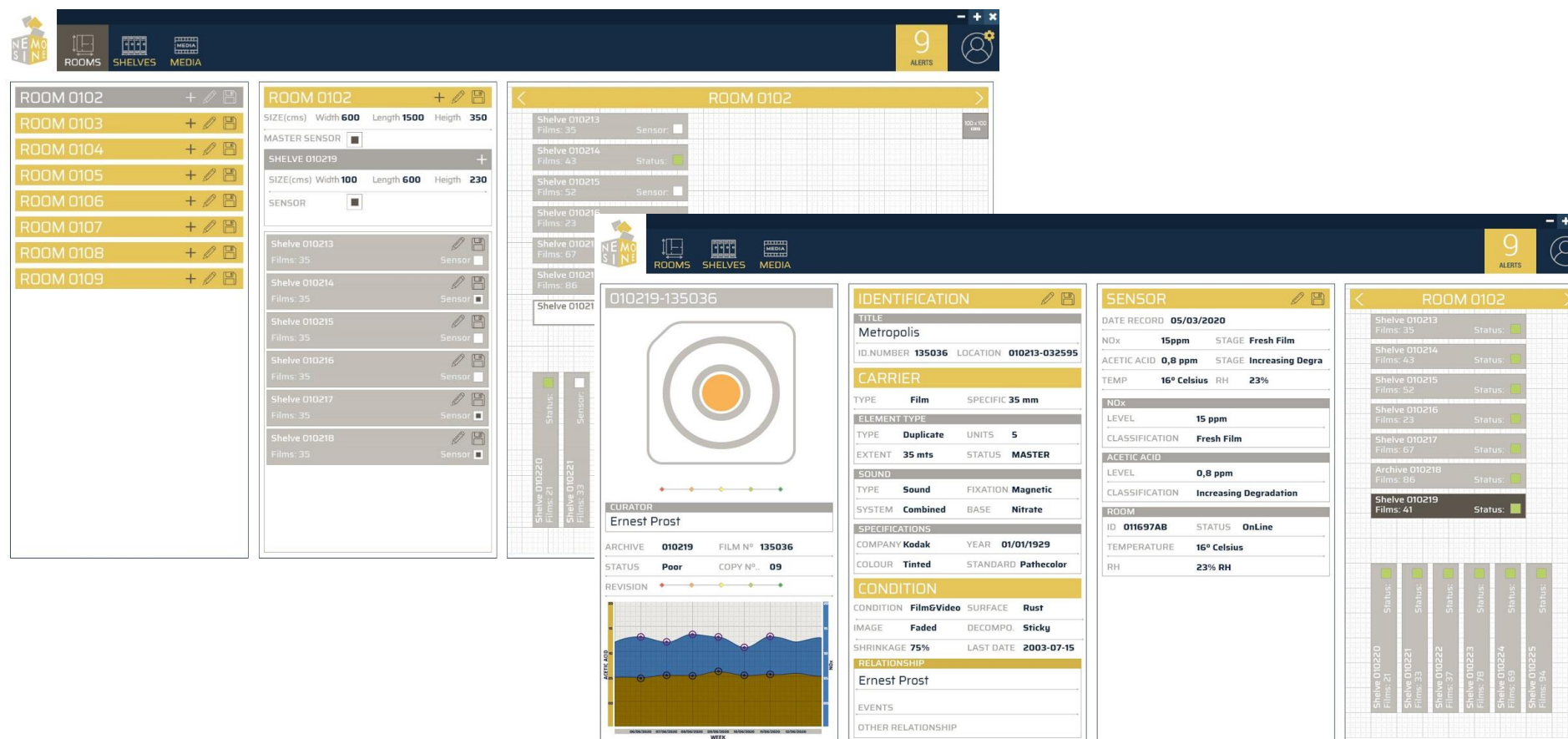
AA absorber and
antifungal
integration

Sensors & Wireless
control

Degradation model
software

Package integration
and Final
Demonstrator

Monitoring, degradation and control platform



Technical approach

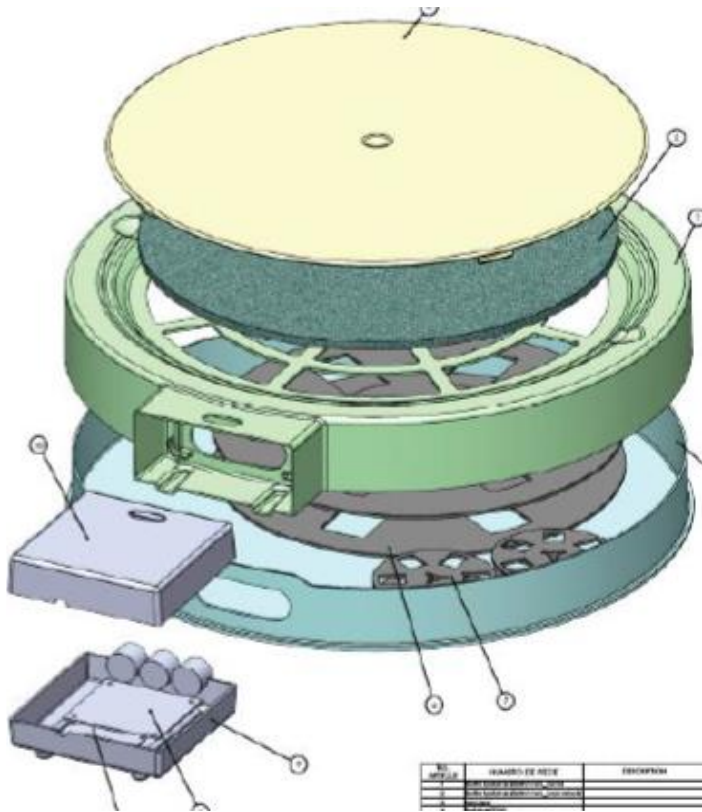
MOF AA Absorber

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Thanks for your attention!

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