



# VIABLE

**Valorisation of lignin biomass into competitive components gradually replacing BPA in the formulation of Epoxy resins**



# Overall context



Epoxy resins are a good choice for making thermosets composite

Family	Resin	Thermal resistance	Chemical resistance	Price (2017)
TS	Polyester	80 °C	Weak to average	2 to 4€ per kg
TS	Vinylester	100 à 140 °C	Very good	4 to 8€ per kg
TS	Epoxy	120 à 200 °C	Very good	6 to 15€ per kg
TS	Polyimide	200 à 300 °C	Good	> 50€ per kg
TP	Polypropylene	80 °C	Excellent	1€ per kg
TP	PU TP	80 °C	Average	4€ per kg
TP	PA 6 et 66	150 °C	Good	3€ per kg
TP	PEEK	300 °C	Very good	> 40€ per kg

GUIDE DU RECYCLAGE ET DE L'ÉCOCONCEPTION DES COMPOSITES, p.8

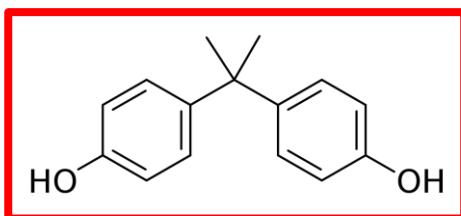




# Overall context

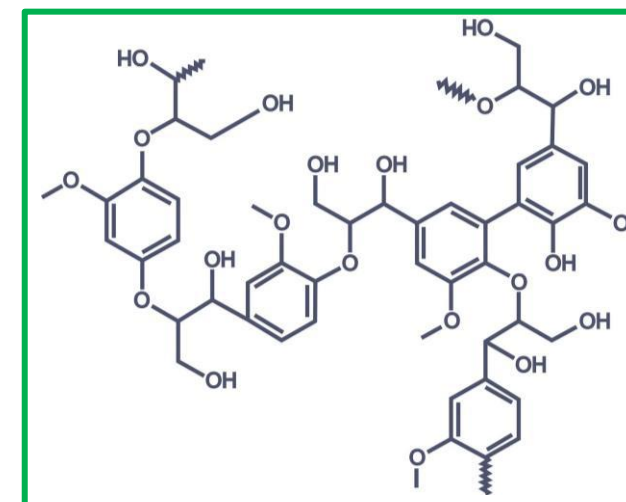


**BPA**

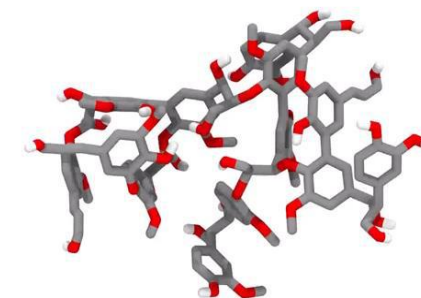
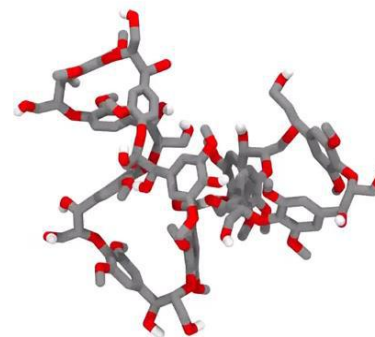
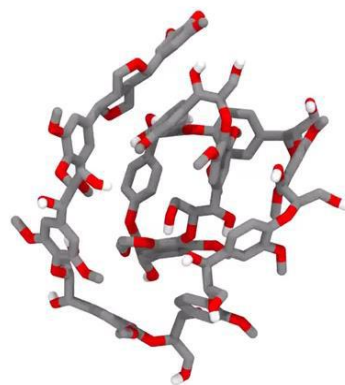


- 90% of epoxy resins comes from **BPA**
  - Production around 345kT per year
- But **BPA** is:
  - Classified SVHC
  - Submitted to Regulatory Measures
  - Fossil-based
- Alternative is needed:
  - Available in large quantities
  - Non-toxic
  - Bio-based
  - Correct price
  - More or less the same properties

**Lignin**



# What is LIGNIN?



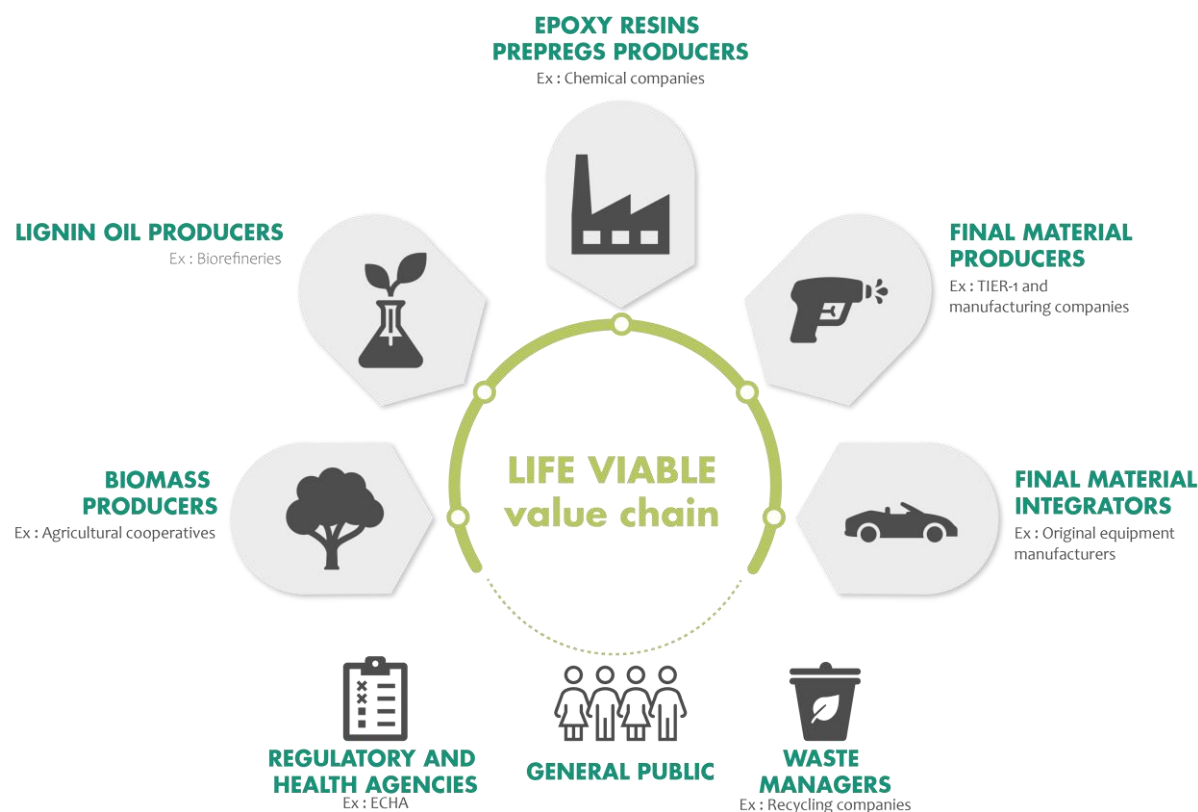
- Biobased macromolecule with a potential abundance of over **300 billion tons**
- **Nontoxic**
- Currently a **waste** of paper industries
- Aromatic structure which gives **good thermal** and **mechanical properties**
- Very **heterogeneous**, needs transformation processes



# Overall context



The LIFE VIALE project will develop **lignin-based epoxy resins** at a **pre-industrial EU scale** by gathering all stakeholders of the value chain.



# Consortium



**cimv**

 **vito**



**STELLANTIS** 

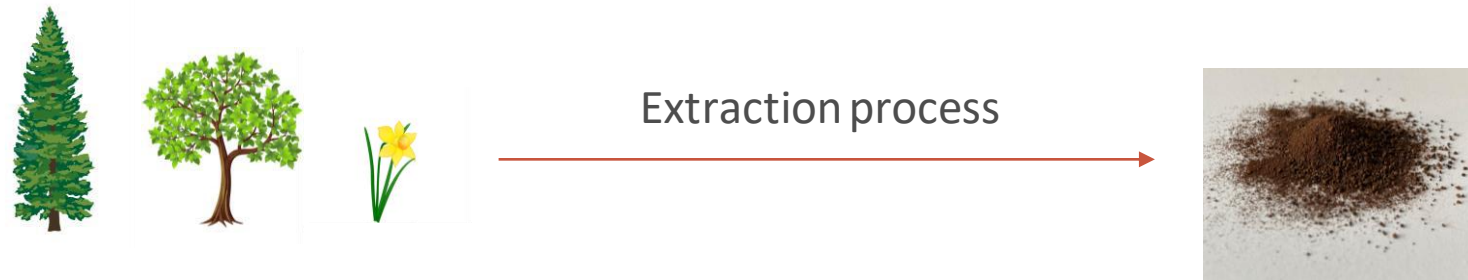




## Role of CIMV

The CIMV logo is displayed in green text inside a white hexagonal shape.

**CIMV provides its expertise in lignin reactivity and produces organosolv lignin**



- Different sources of lignin: Sugarcane Bagasse, Corn Stover, Wheat Straw, Hardwood (Birch)
- Different extraction processes
- Lead to specific lignin structures and properties

## Role of VITO



VITO, through their LIGNOVALUE pilot plant, ensures the depolymerisation of lignin, its fractionation and the supply of bio-based alternatives for BPA



Depolymerisation  
process



Epoxidation



- Continuous process used for the depolymerisation
- Use of solvent, mainly alcohol





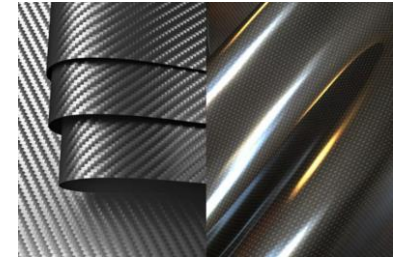
## Role of SOLVAY



SOLVAY produces the lignin-based epoxy resins and the pre-preg



Formulation +  
pre-preg production

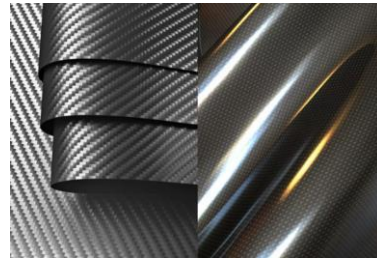


- Incorporation of lignin-based epoxy resins in the formulation
- Pre-preg production for aesthetic and structural car parts from the resins formulated

## Role of HP COMPOSITES



HP COMPOSITES makes composites from the new epoxy resins for both aesthetic and structural car parts



Making aesthetic  
and structural car parts →



- Design, manufacture, and optimise the composite materials to reach the best configurations
- Two formulations will finally be selected

## Role of CRF (STELLANTIS)



## CRF demonstrates the feasibility of these car components

Car components

Validation for car  
manufacturing →



- Validate the prototypes in car manufacturing processes
- Two car components, integrating the new composites, will be designed and manufactured
- A study to assess the end-of-life with recycling methods will be conducted

## Role of APESA



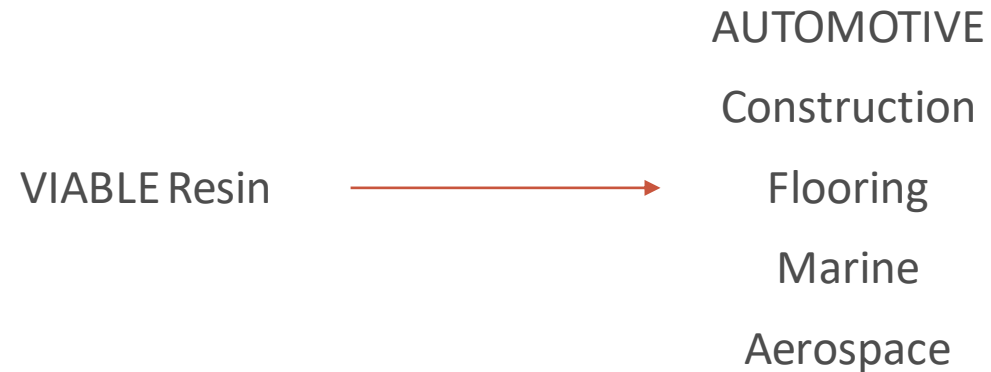
## APESA will be in charge of monitoring the different impacts of the project

- Life Cycle Analyses (LCA)
- Social Life Cycle Analysis (SLCA)
- Life Cycle Cost (LCC)

## Role of POLYMERIS



## Dissemination and valorization of the results will be performed by POLYMERIS



- Dissemination at regional, national and international scales to stakeholders of the epoxy resin value chain





## Conclusion & Final objectives



- Reduce the environmental and health impacts of BPA by lowering its content in the formulation of epoxy resins by 20 to 50%.
- Demonstrate the technical, environmental, and socio-economic performances of a future viable alternative to BPA in epoxy resins for high performance applications
- Adapt industrial processes of the whole value chain for the large-scale production of LIFE VIABLE composite material
- Widely disseminate the project results towards end-users, policymakers, chemical and biomass industries
- Prepare the market penetration and exploitation of the solution



Thanks for  
listening!

Any question?