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Ph.D. thesis (2024-2027)
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Formulation of high-performance bituminous binder, mostly biobased, with a low environmental footprint

Formulation de liants « de type bitumineux » hautes performances, majoritairement biosourcés et à faible empreinte environnementale

BioChip

Context

Challenge: Reduce the use of fossil fuel (ex**: crude oil**) by 2050
(Recommendation by IRENA)

What? A hydrocarbon-based product derived from **crude oil** refining, known as **bituminous binder:**

- **Properties**: Waterproofing & adhesion
- **Uses** & **production**: Road industry (85%) & roofing (15%)

100 Mt = **40 Mt CO_2eq/yr**

Global bitumen production/yr

Solutions: Substitution of bitumen in binders by **bioresources** to minimize fossil-based product consumption

Funded by:
EIFFAGE
SOPREMA Building for Life

Objectives

Development of a new biobased binder

Bituminous binder → **Biobased binder**

With the same

- Rheological properties
- Colloidal structure

& with sustainable bioresources available on a large scale

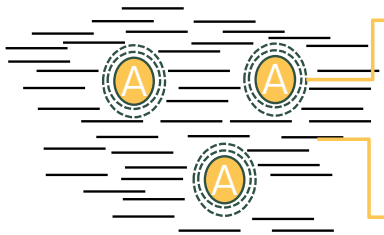

Figure : Structure of bitumen

Methods

Materials:

Aphaltenes → *Substitued by* → **Bio polymer**

Maltenic matrix → *Substitued by* → **Bio maltenic matrix**

Methods:

- **Selection** & **Screening** of bio polymer and bio Maltenic matrix
- **Preparation of colloidal dispersions**

Optimization of the mixing protocol (polymer type and content, temperature and mixing time) to match the properties of commercial bitumen.

- **Dispersions characterisations**
  - Rheology
  - Microscopy
- **Understanding physico-chemical interactions**
  - NMR, SEC, SAXS