

Grenoble  
pagora



Grenoble  
phelma



# MASTER DEGREE

One Year Master Program

MSE (Materials Science & Engineering)



# BIOREFINERY & BIOMATERIALS



# PLANT BIOMASS, TOWARDS A GREEN FUTURE

**Plant biomass is a source of energy, materials and chemical products whose vast and renewable potential is paving the way to an oil-free future.**

In a biorefinery operation, components from biomass can be extracted, isolated and modified to produce gaseous or liquid fuels as well as specialty and commodity chemicals. The latter may in turn be converted into biomaterials.

The Master Degree is based on scientific expertise of Grenoble INP-Pagora coming from its innovative research in the conversion of plant biomass components and strong links with industry. It covers the entire chain from biorefinery to the production of bioenergy, bioproducts and biomaterials. This whole chain is today considered as the most exciting and efficient move towards a sustainable society and a provider of new job opportunities.



## Master Degree Program

This training is provided in English

- Duration: 1 year (from September to July)
- Location: Grenoble University Campus
- Open to Engineers & Masters

Tuition fees:	243 € / year EU citizens 3770 € / year non EU-nationals
Partial payment:	500 € (beginning of June)



# MASTER PROGRAM CONTENT

## Biorefinery, general and basic aspects

Oil, coal, gas and biomass, plant chemical components (cellulose, lignin, hemicelluloses, starch, sugars, oils, tannins and other extractives). Polymer chemistry, characterization, structure and properties, polymer industry.



## Biorefinery for energy

Pretreatment and saccharification of biomass, fermentation, production of bioethanol and biomethane. Torrefaction, pyrolysis and gasification of lignocellulosics. Production of diester. Worldwide activities and perspectives.

## Biorefinery for bioproducts

Existing biorefinery and conversion processes. Cellulose, starch, sugars and derivatives, resin acids, terpenes, rubber, lignin derivatives... Diacids, levulinic acid, furan derivatives, xylitol, sorbitol, diols, diamines, phenols...

## Assessment of sustainability

Principles of life cycle analysis, end of life, environmental factors, energy consumption, toxicity, competition of raw materials, risk assessment...

## Biomaterials

**Biopolymers:** natural polymers, synthetic polymers from natural resources (PLA, PBS, polyamides, polyethylene, PHA...) Structure and properties, future bio-sourced polymers, technical and scientific challenges.

**Composites:** natural fibers for composites, structure and properties, fibre-matrix compatibility and adhesion...

**New biomaterials:** complex and laminate bio-based materials, nanocellulose, bio-nanocomposites, active biomaterials, production and properties.

## Job opportunities

This expertise is of particular interest in the chemical, material, plastic, cosmetic, detergent, textile, building, packaging, engineering and energy industrial sectors.



# Grenoble INP Institute of engineering Univ. Grenoble Alpes

## A major Institute of Engineering in France

- 6 engineering schools delivering more than 1250 engineering degrees per year (equivalent to a Master degree)
- 230 PhD theses defended every year



## 2 graduate school of engineering involved

### Grenoble INP-Pagora

- Specialized in Paper, Print media and Biomaterials Sciences
- Strong partnerships with related industrial sectors
- A world-class research laboratory (LGP2) active in wood and fiber chemistry, biorefinery, biomaterials, fiber properties and process engineering

### Grenoble INP-Phelma

- Specialized in Physics, Electronics and Materials Science
- Provides a mixed education of physics and chemistry, oriented towards the key areas of 21<sup>st</sup> century industry: electrochemistry and physicochemical processes
- Research laboratories: LEPMI, SIMAP, LMGP, LGP2, SPram





## Eligibility criteria

Having completed at least one year study in a Master program\* (Master 1 program in France or 4 years of higher education program abroad) in chemistry, biochemistry, chemical engineering, polymeric materials or equivalent thematics.

→ English: minimum level B1 European standard mandatory, B2 level highly recommended

\*for a 2 years Master program, Check our website

## Admission

Application from November to mid of May



## Grenoble INP - Pagora staff and partners

- Lectures are given by Professors from Grenoble INP-Pagora, Grenoble INP-Phelma and industrial experts. (IFPEN, Mines Albi)
- Research partners : LGP2, Polynat Carnot Institute, CDP Glyco@Alps...
- Conferences and site visits are organized

## Industrial partners in biorefinery and biomaterials

Novamont, Dow Corning, Roquette, Cargill, JRS Rettenmaier, Smurfit Kappa, Solvay, Lafarge, Arjowiggings, L'Oréal, Tetra Pak, Arkema, Schneider Electric, Seppic, Novasep, Degrémont, Condat Lubrifiant, Air Liquide, Siegwark, Fibre Excellence, Total, Soprema, Ahlstrom-Munksjö, CEA, CTP, FCBA, Xylem...



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## Contact

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