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Rappresentante UNISI Cluster SPRING



UNIVERSITÀ  
DI SIENA  
1240



DIPARTIMENTO DI BIOTECNOLOGIE,  
CHIMICA E FARMACIA

## UNIVERSITÀ DI SIENA

- ✓ 33 corsi di laurea,
- ✓ 37 corsi di laurea magistrale,
- ✓ 5 corsi di laurea magistrale a ciclo unico e a normativa UE
- ✓ 1 laurea, 1 laurea magistrale a ciclo unico e a normativa UE e 16 lauree magistrali in lingua inglese
- ✓ 14 dipartimenti
- ✓ 18 dottorati di ricerca - 39° ciclo
- ✓ 59 master universitari
- ✓ 41 scuole di specializzazione

(Dati AA 2023/2024)



Cluster italiano della Bioeconomia circolare

SPRING Networking Annual Event - Roma  
26 giugno 2024

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**UNISI:**

- **Recupero e valorizzazione dei prodotti secondari delle produzioni agricole e agroindustriali**
  - Estrazione e caratterizzazione chimica dei componenti bioattivi presenti nei prodotti secondari delle produzioni agricole e agroindustriali e identificazioni dei potenziali utilizzi per le industrie alimentari, cosmetiche e farmaceutiche
- **Produzione di biocompositi ad alto valore aggiunto a partire da scarti della lavorazione del pesce**
- **Prototype realization and characterization of biocomposites at gram scale**
  - Haake double screws miniextruder,
  - Haake Minijet injection molding
  - Dynamoter and Die Cutting Machine( Instron)
  - Industrial 3d Printer working with pellets( WASP)
  - Laboratory Platen press (Fontijne)
  - Microfluidic extruder for the preparation of nanosystems for controlled release
- **Physico-Chemical characterization**
  - Spectroscopic and spectrophotometric analysis: UV-Vis, EPR, NMR, DSC, AFM, TEM, FT-IR, Mass spectrometries
- **LCSA** (LCA, LCC, s-LCA)

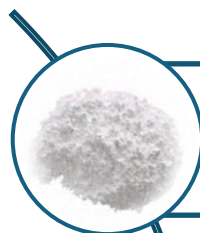
# Biocomposite from marine waste

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- The waste of marine food production (particularly exoskeleton of crabs, lobsters and shrimps) is the main industrial source of biomass for chitin production
- 6 to 8 million tons each year in the fishing industry

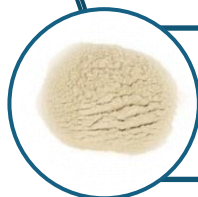


# Shell Biorefinery



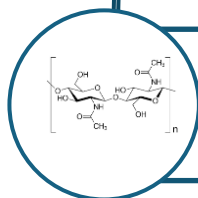
## **CaCO<sub>3</sub>** (20-50%)

- Pharmaceutical, agricultural construction and paper industries including pigments, fillers, soil treatments, rubber and plastics



## **Proteins** (20-40%)

- Fertilizers and animal feeds



## **Chitin** (15-40%)

- Nitrogen-rich chemicals for pharmaceuticals, cosmetics, textiles, water treatment, household cleansers, soaps, carbon dioxide sequestration



## **Astaxanthin**

- Antioxidant pigment

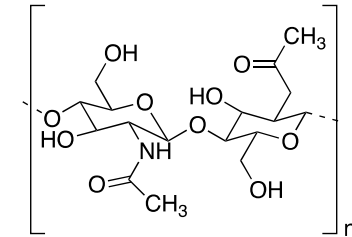
# Chitin, Chitosan and COS

## PROPERTIES

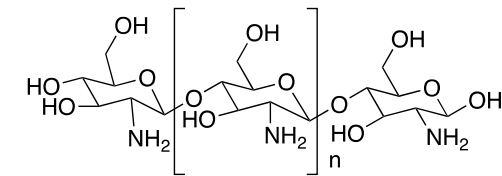
- Biodegradability
- Non-toxicity
- Biocompatibility
- Good film-forming properties
- Chemical stability
- High reactivity
- Intrinsic antioxidant and antimicrobial activity

## APPLICATIONS

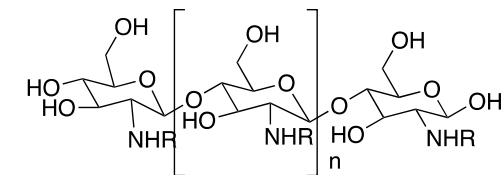
- Antimicrobial agent
- Edible film and coating in food industry
- Additive
- Integrator (dietary fiber)
- Enzyme immobilization
- Encapsulation of nutraceutical
- Purification of water
- **Food packaging**



Chitin



Chitosan



R= H or Ac n= 0 to 8

Chitooligosaccharide



# FISH4FISH - FISH chitinolytic biowastes FOR FISH active and sustainable- 863697

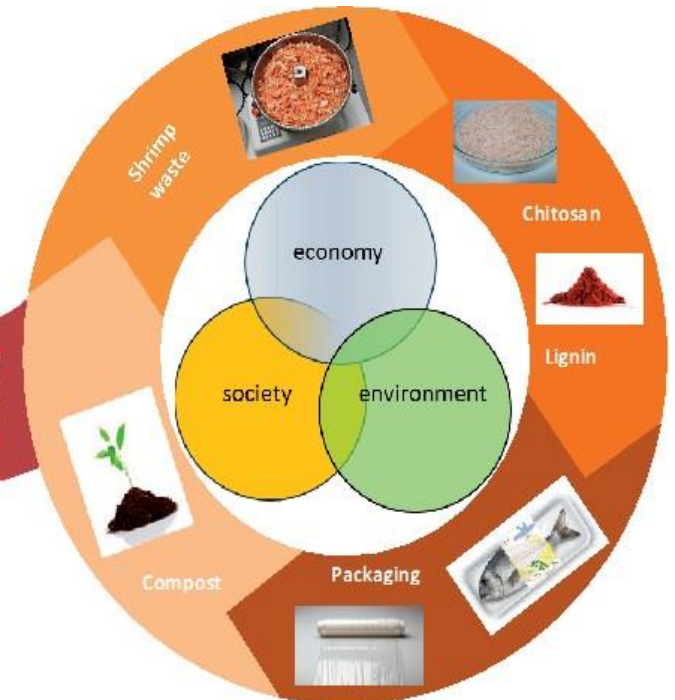


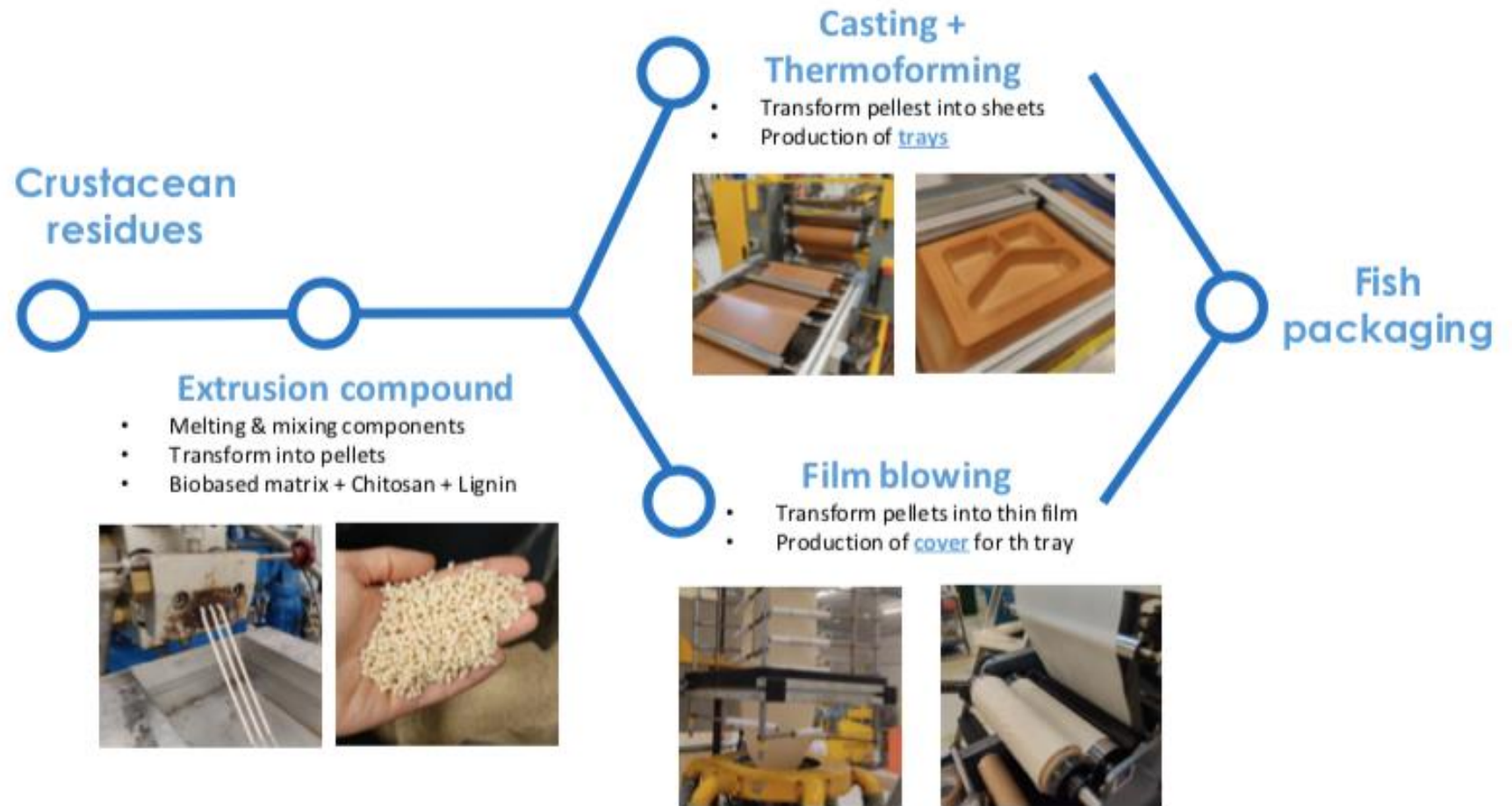
Co-funded by the EMFF programme of the European Union

- ✓ Reduction of plastic pollution from coasts and seas (2018 blue economy report, Horizon Europe Mission – Healthy Ocean)
- ✓ New value to the fish industry waste
- ✓ Enhance competitiveness of fish-processing industry
- ✓ Reduction of food waste
- ✓ Contribution to soil health (Horizon Europe Mission – Healthy Soil and Food)
- ✓ Implementation of Sustainable Development Goals (SDGs)



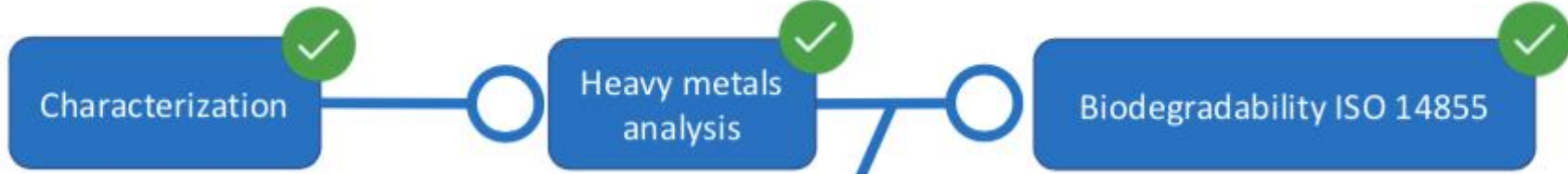
F4F project in a nutshell







The material was subjected to EN13432 to assess the biodegradability properties



Basic identification of the material

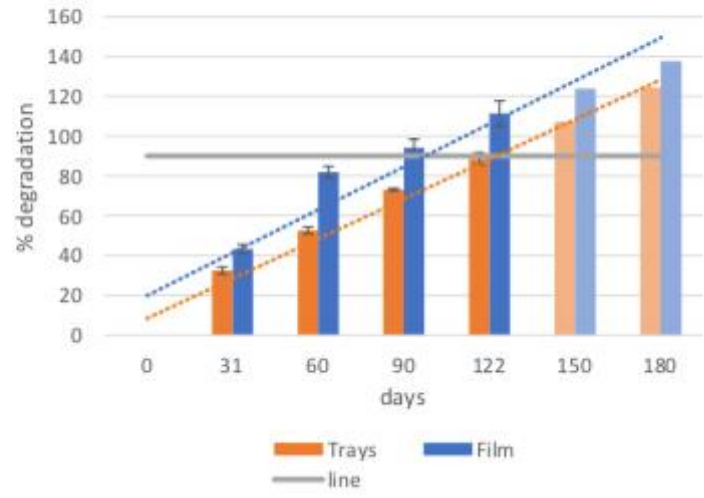
To look for toxic metals and substances

Up to 180 days – 90% degradation  
**Study made for 120 days**

Good germination and plant growth

Disintegration ISO20200  
Lab scale  
• **Trays – 98,09%**  
• **Film – 99,51%**

Biodegradability Fish4Fish



TROPOMYOSIN MIGRATION



No migration!



EMFAF –EU- WINBLUE project 101112278  
Empowering Women and Mainstreaming Gender Equality  
in the Blue Economy



Agritech National Research Center funded by European Union Next-GenerationEU –  
PIANO NAZIONALE DI RIPRESA E RESILIENZA- PNRR –  
MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.4 – D.D. 1032 17/06/2022-  
CN00000022

**METRO  FOOD - IT**

METROFOOD-IT è un'infrastruttura nazionale finanziata dal Piano Nazionale di  
Ripresa e Resilienza (PNRR)  
PACKAGING LAB - Un laboratorio di ricerca e di implementazione di tecnologie innovative per la  
creazione di packaging sostenibile.



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