Design of a CHEMICAL/BIOLOGICAL biphasic process for circular economy for the conversion of POLYURETHANE into agronomic biostimulants.

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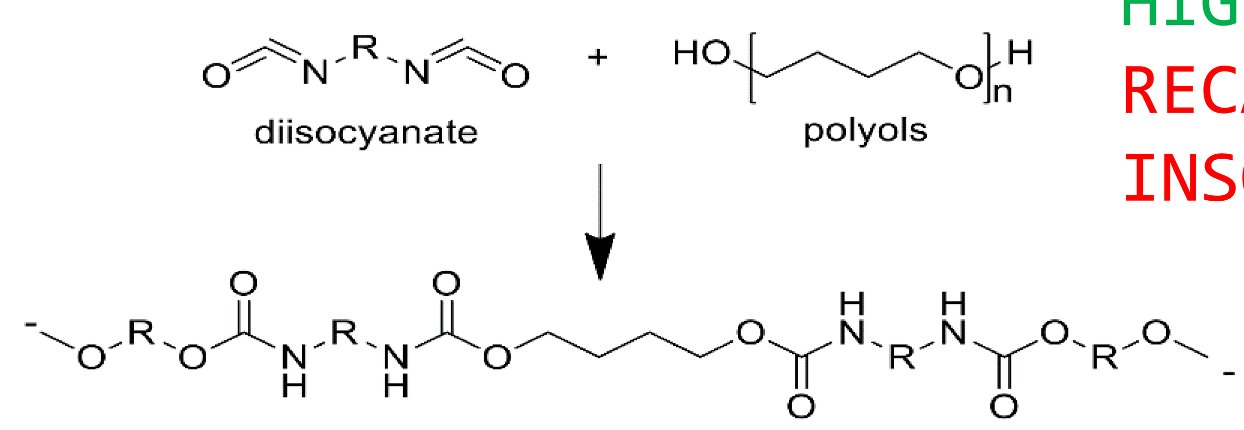
POLYURETHANE

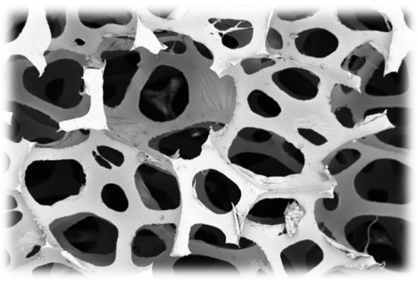


ORGANIC COMPOSITION

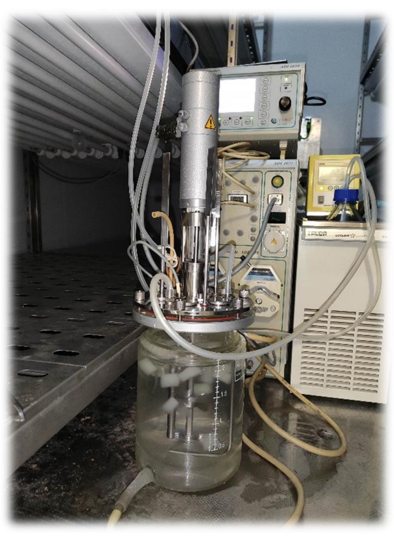
HIGH NITROGEN AND CARBON CONTENT

RECALCITRANT: HARDLY DEGRADATION

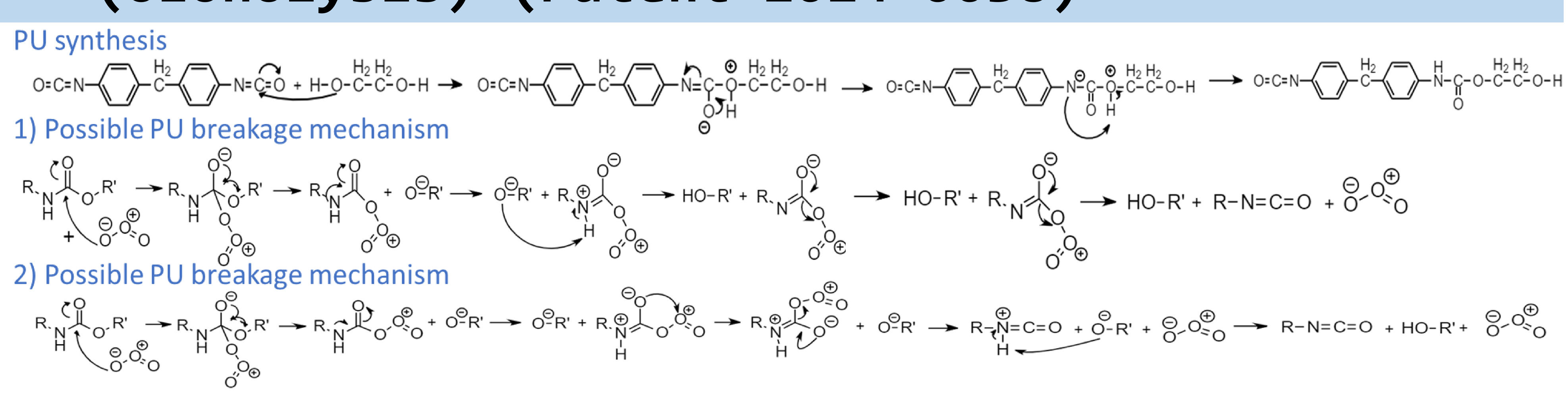
INSOLUBLE



Production 30 million tons annually.
Landfill accumulation
Incineration.
Chemical Pullution linked to Chemical recycling.

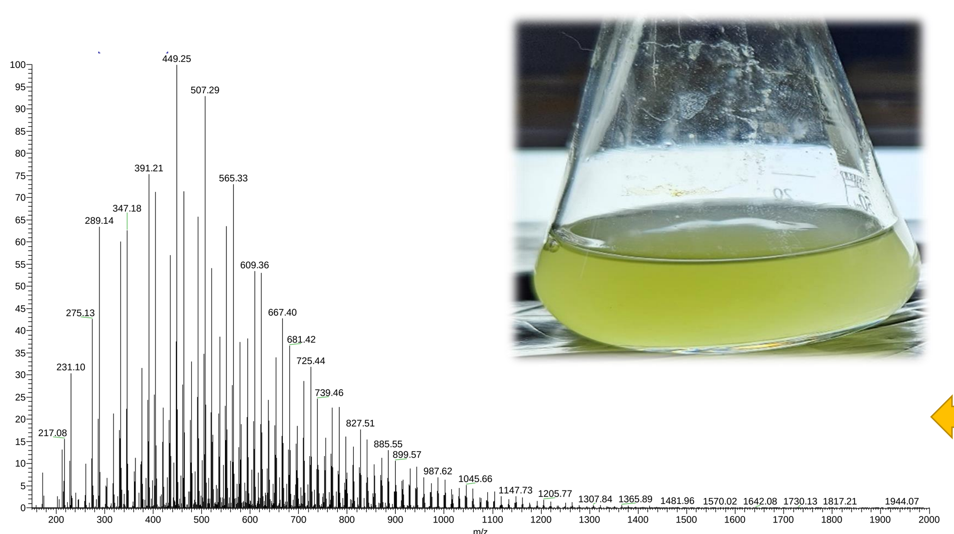


1.CHEMICAL PROCESS DEPOLIMERIZATION (Ozonolysis) (Patent 2024-0038)

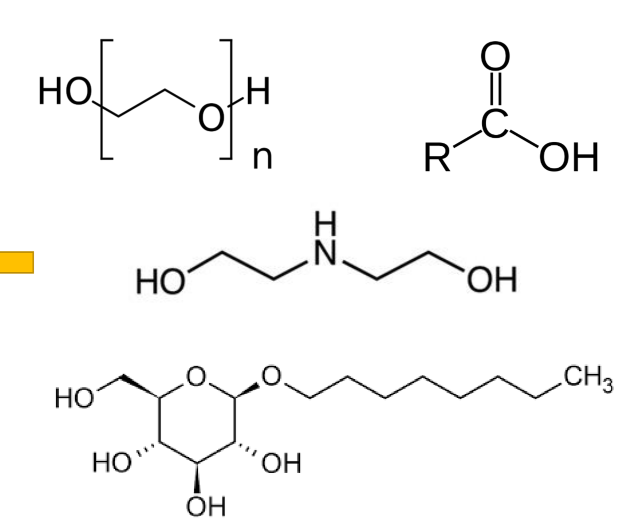


OXIDIZED LIQUID EXTRACT (OLE)

Polyols, carboxilic acids, amino alcohols



Mixture of Low molecular weight (<600 Da) water soluble



BIOSTIMULANTS

Non-toxic compounds.
Bioavailable.
Metabolizable.
Support plant and bacteria growth (Unique C/N source).

2. BIOLOGICAL PROCESS

Bioconversion in Sugars, amino acids, peptides or proteins

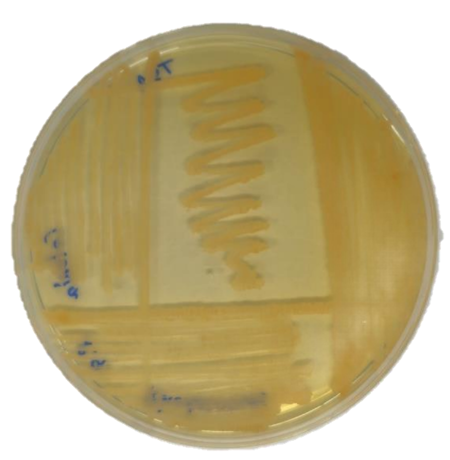
Synthetized enzymes:

PETases

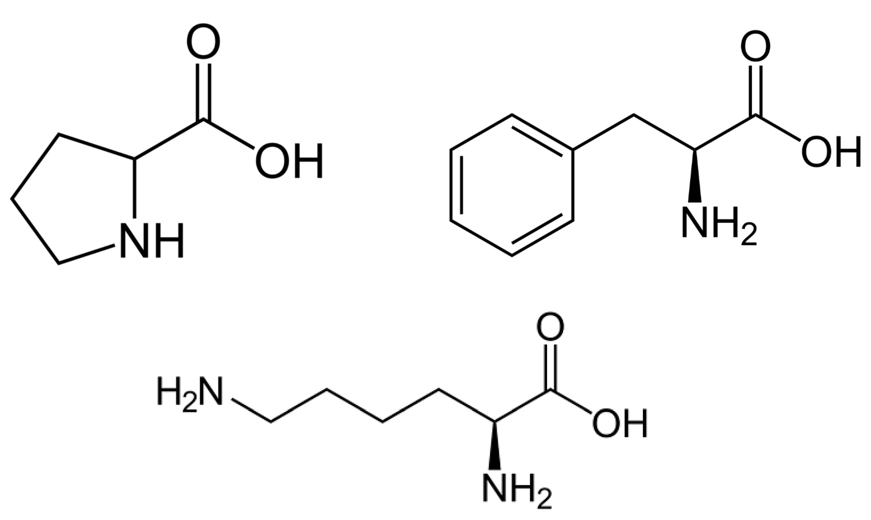
- Cutinase
- Esterase
- FAD binding Oxidoreductase
- Dihydrolypoyl dehydrogenase
- Alpha/Beta Hydrolase
- Superoxide dismutase
- Cytochrome P450
- Multicopper oxidase

GROWTH BIOFERTILIZER BACTERIA

Rhodococcus pyridinivorans



NITROGEN FIXATION
PRODUCTION OF SIDEROPHORES
PRODUCTION OF AUXINS
BIOFILM



Conclusion

Through our two-phase process (chemical-biological), we convert a long and difficult to biodegrade polymer, such as PU, into non-toxic low molecular weight molecules through a ozonolysis process, which fully supports the growth of plants and bacteria. They can be metabolized as the sole source of carbon, nitrogen and energy by Plant Growth-Promoting bacteria and converted into biomass with biofertilizing activity (phosphorus solubilization, production of auxins, siderophores, nitrogen fixation and biofilm formation) as *Rhodococcus pyridinivorans*, and biological metabolites/polymers, such as proteins, amino acids, organic acids, etc. In turn, R.pyridinivorans is capable of synthesizing numerous enzymes involved in the degradation of plastic polymers such as PET using PETases (esterases, cutinases, oxidoreductases, etc.)

@PLANTBIOSTIMULANT