

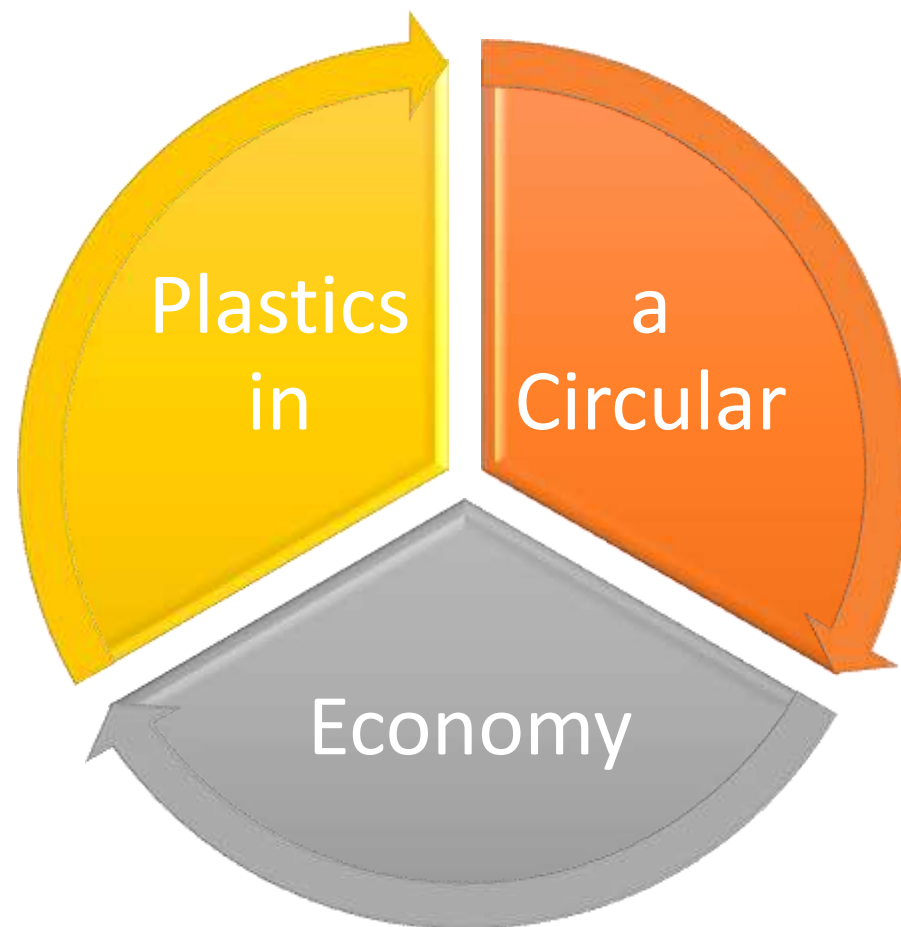


DEQ
DEPARTAMENTO
DE ENGENHARIA QUÍMICA
TÉCNICO LISBOA



CERENA

Centro de Recursos
Naturais e Ambiente



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The two categories of plastics

Thermoplastics

are a family of plastics that can be melted when heated and hardened when cooled. These characteristics, which lend the material its name, are reversible. That is, it can be reheated, reshaped and frozen repeatedly.

Polyethylene (PE)	Polycarbonate (PC)
Polypropylene (PP)	Poly methyl methacrylate (PMMA)
Polyvinyl-chloride (PVC)	Thermoplastic elastomers (TPE)
Polyethylene Terephthalate (PET)	Polyarylsulfone (PSU)
Polystyrene (PS)	Fluoropolymers
Expanded polystyrene (EPS)	PEEK
ABS	POM
SAN	PBT
Polyamides (PA)	Etc.

Thermosets

are a family of plastics that undergo a chemical change when heated, creating a three dimensional network. After they are heated and formed these plastics cannot be re-melted and reformed.

Polyurethane (PUR)
Unsaturated polyester
Epoxy resins
Melamine resin
Vinyl ester
Silicone
Phenol - formaldehyd
Urea - formaldehyd
Phenolic resins
Acrylic resins
Etc.

Why Plastics?

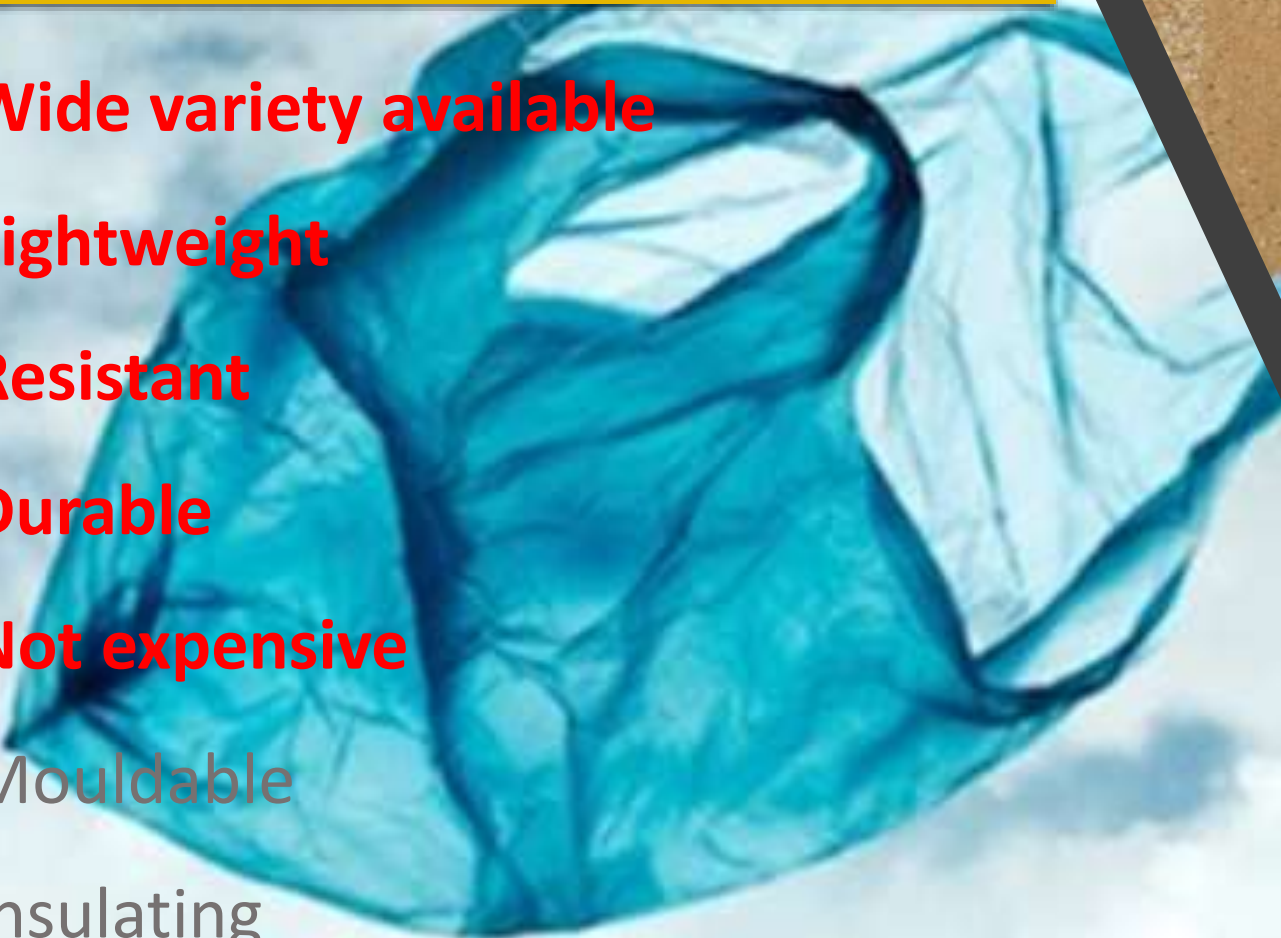
Why Plastics?

- ✓ **Wide variety available**
- ✓ **Lightweight**
- ✓ **Resistant**
- ✓ **Durable**
- ✓ **Not expensive**
- ✓ **Mouldable**
- ✓ **Insulating**



The problem with plastics

- ✗ **Wide variety available**
- ✗ **Lightweight**
- ✗ **Resistant**
- ✗ **Durable**
- ✗ **Not expensive**
- ✓ Mouldable
- ✓ Insulating



The problem with plastics

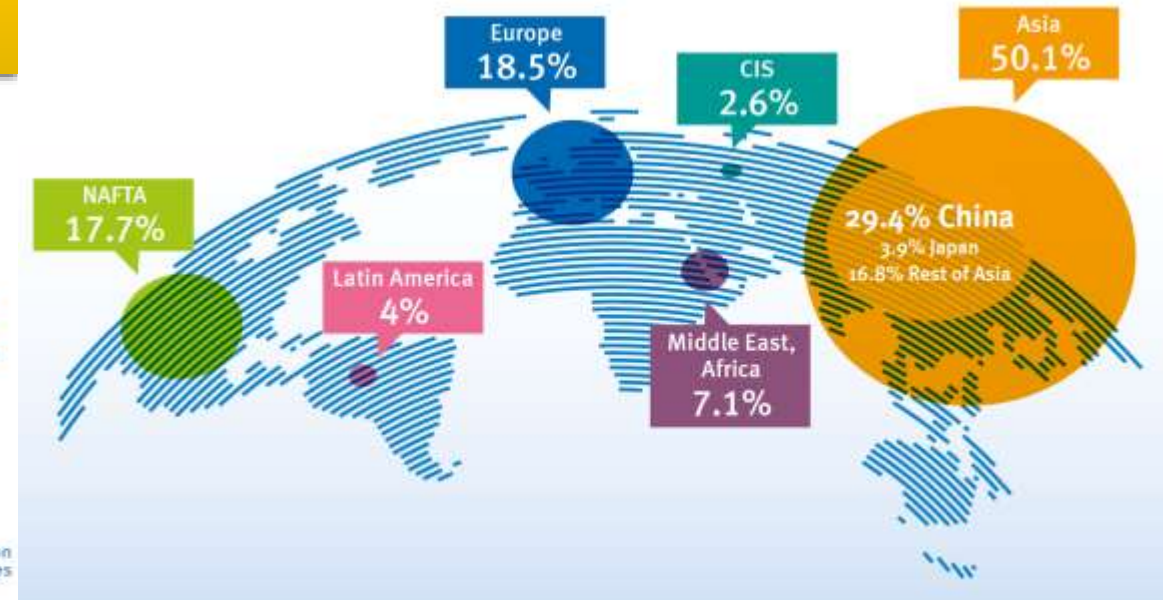
World and EU plastics production data

The world plastic* production almost reached 350 million tonnes in 2017.

Source: PlasticsEurope Market Research Group (PEMRG) / Conversio Market & Strategy GmbH



Includes thermoplastics, polyurethanes, thermosets, elastomers, adhesives, coatings and sealants and PP-fibers.
Not included PET-, PA- and polyacryl-fibers.



Facts about plastics



LIFE SERVICE OF PLASTIC PRODUCTS

The service life of plastic products goes from less than 1 year to 50 years or more



PLASTIC WASTE generation

NON COLLECTED WASTE

Plastic become waste at the end of their service life

COLLECTED WASTE

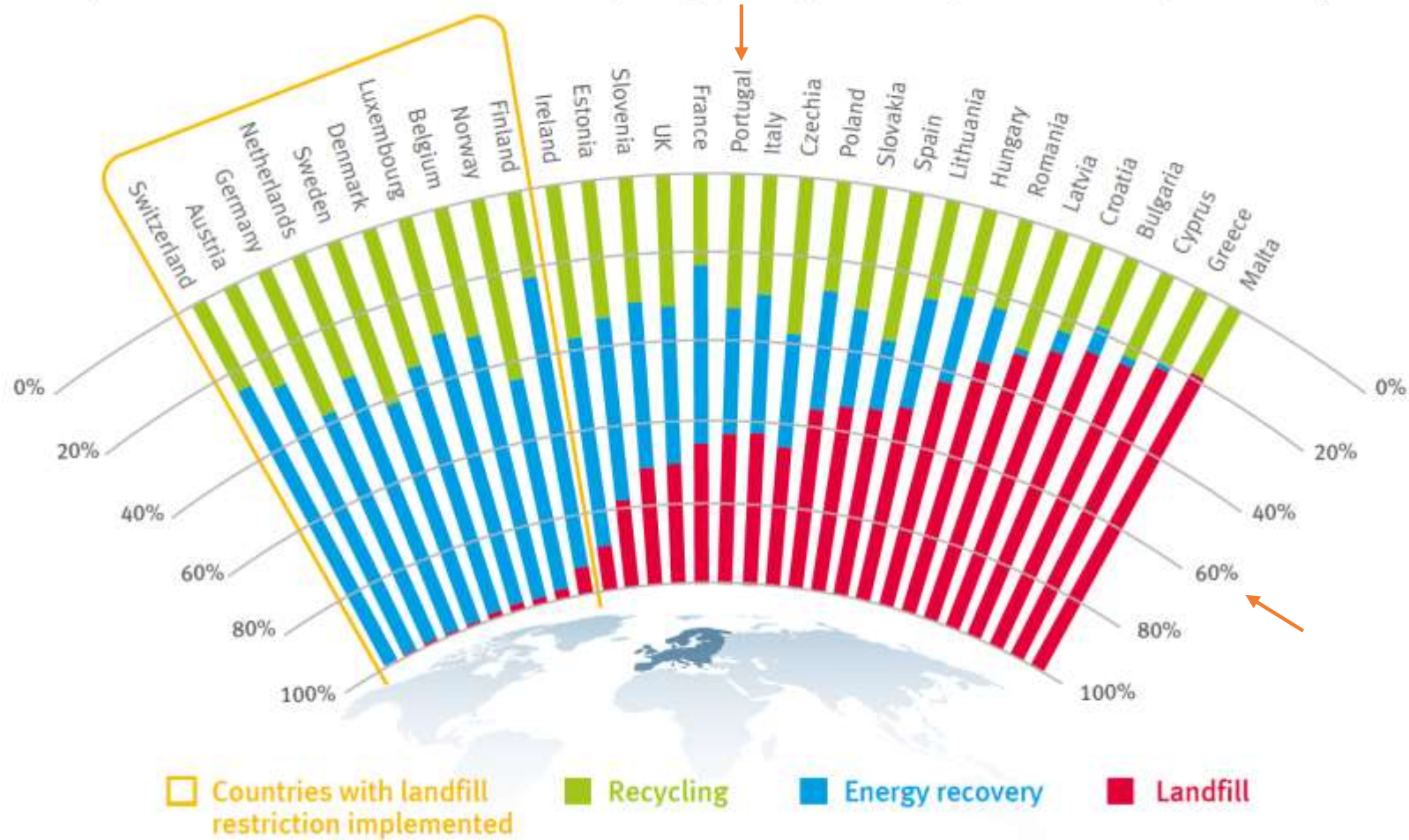


Data for EU28+ NO/CH



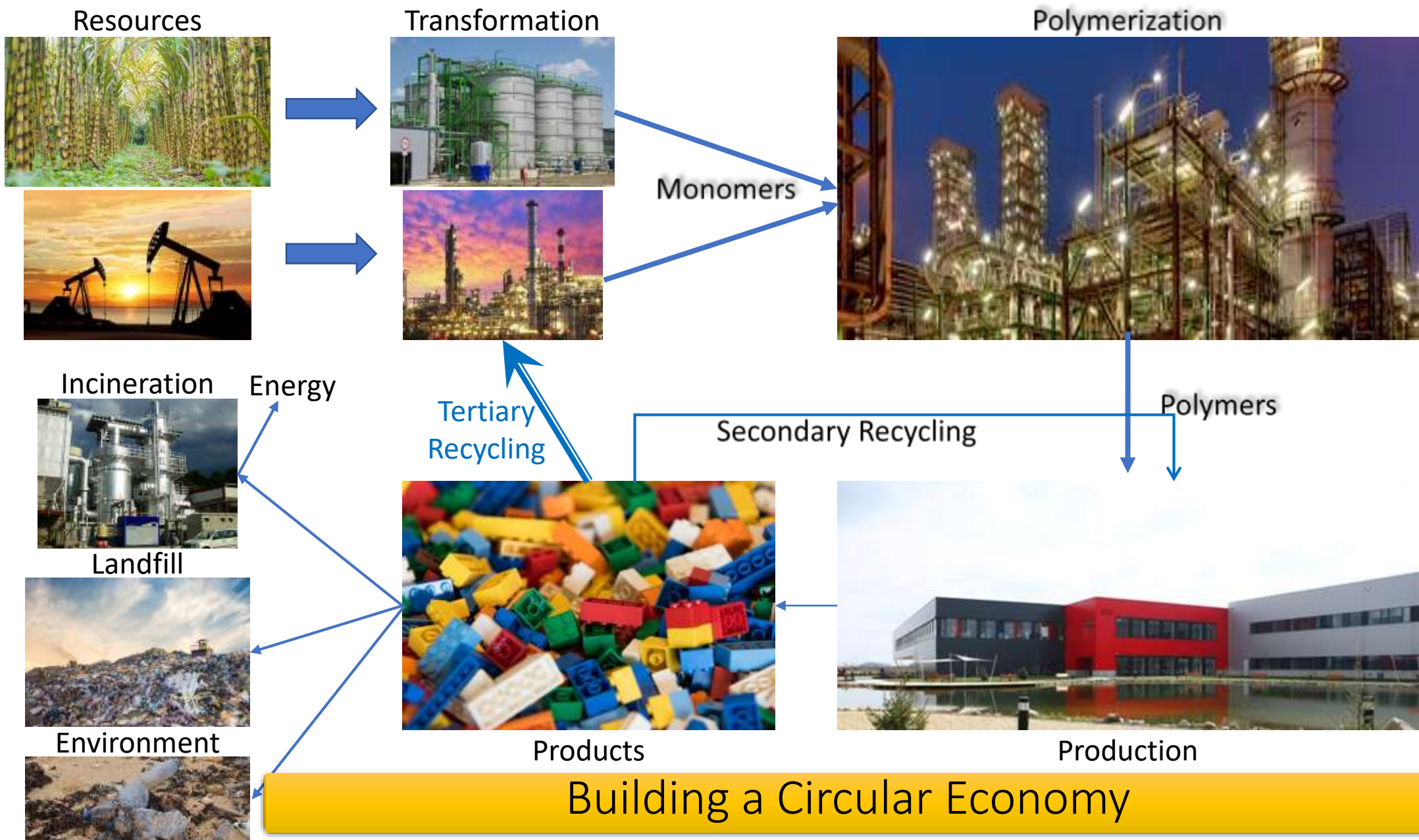
How Europe deals with plastics

Plastic post-consumer waste rates of recycling, energy recovery and landfill per country in 2016



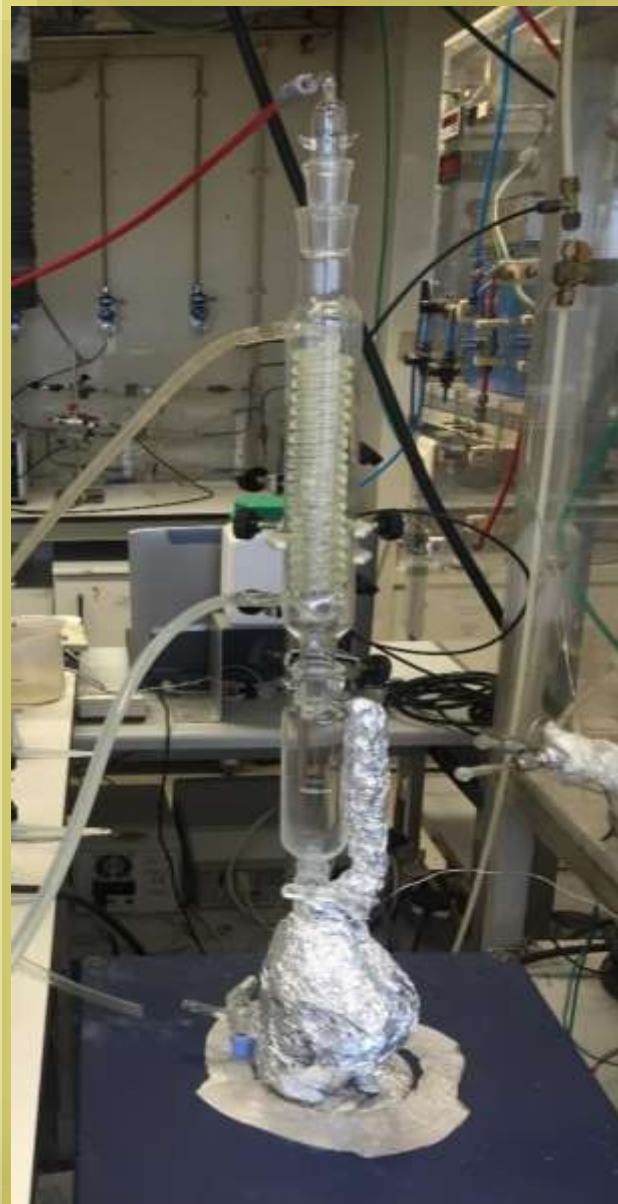
How Europe deals with plastics





Research at CERENA

Waste
Plastics



Pyrolysis
Oils

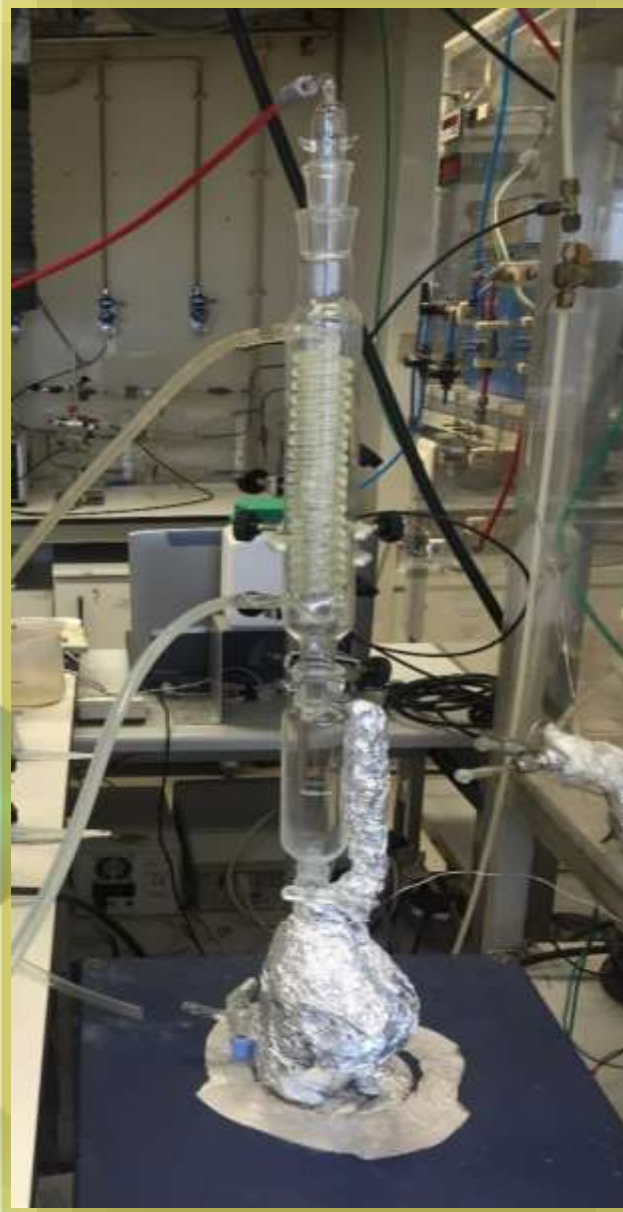
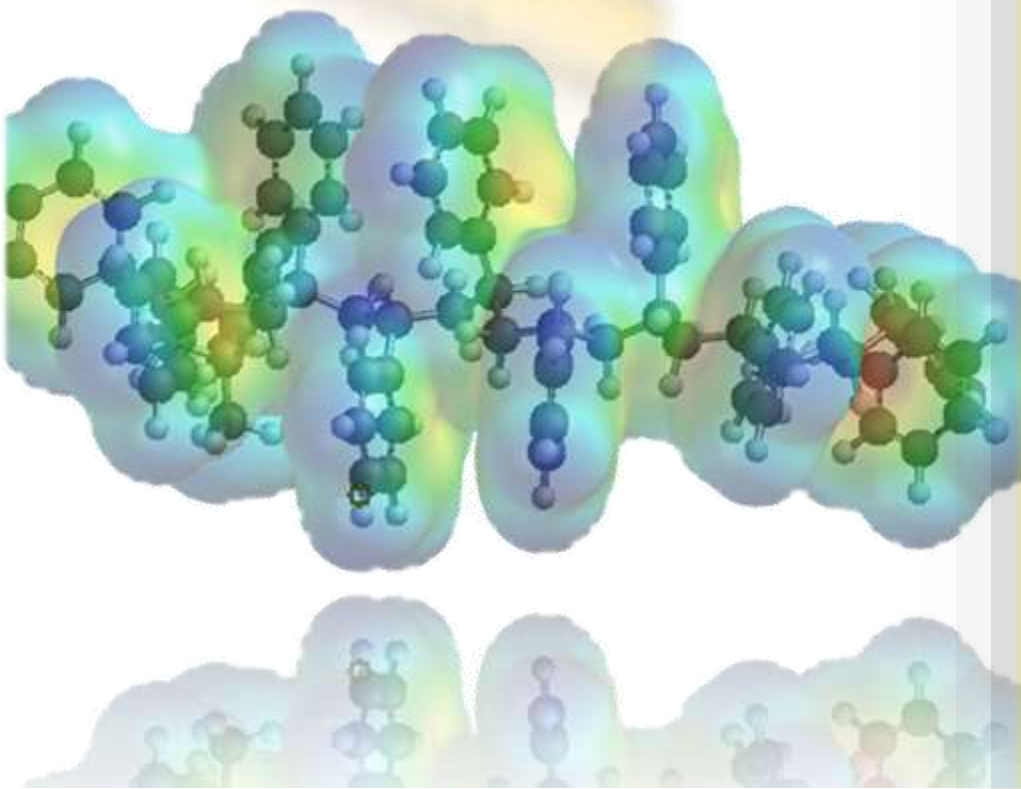


Oils

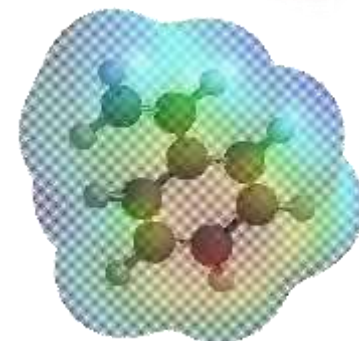
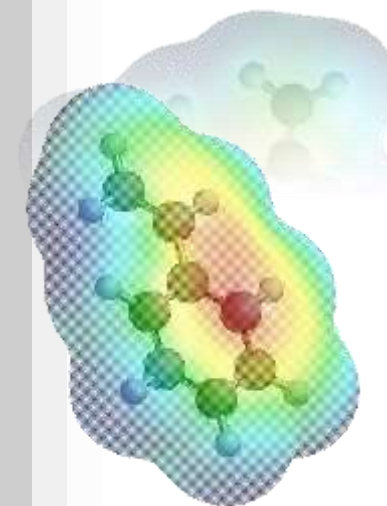
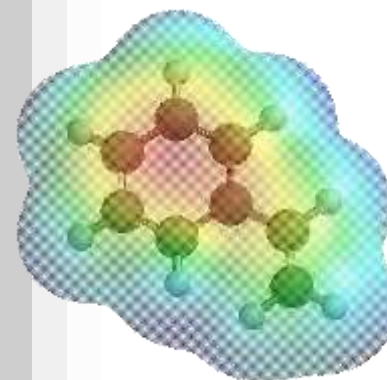


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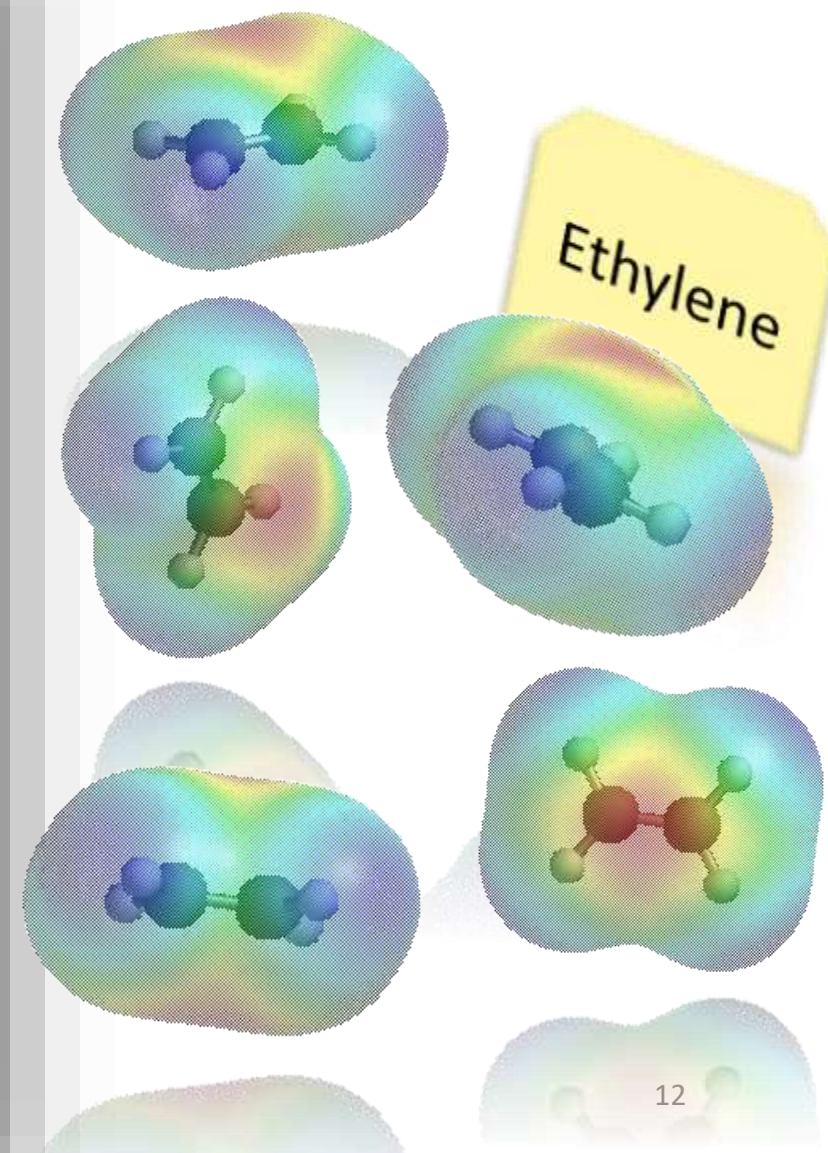
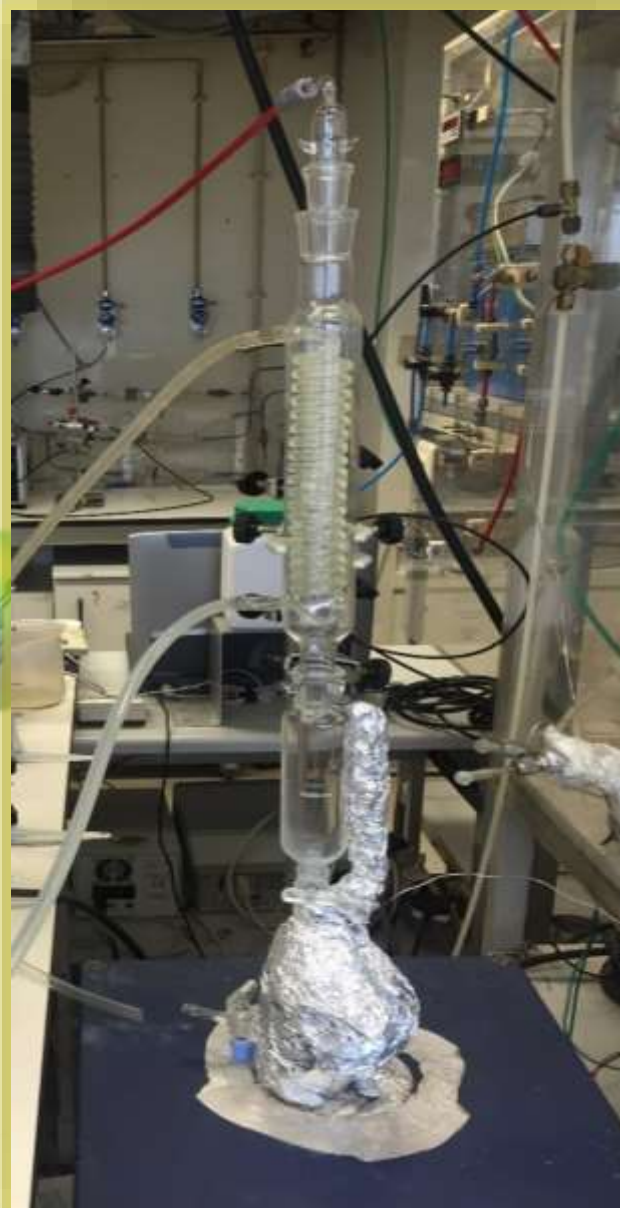
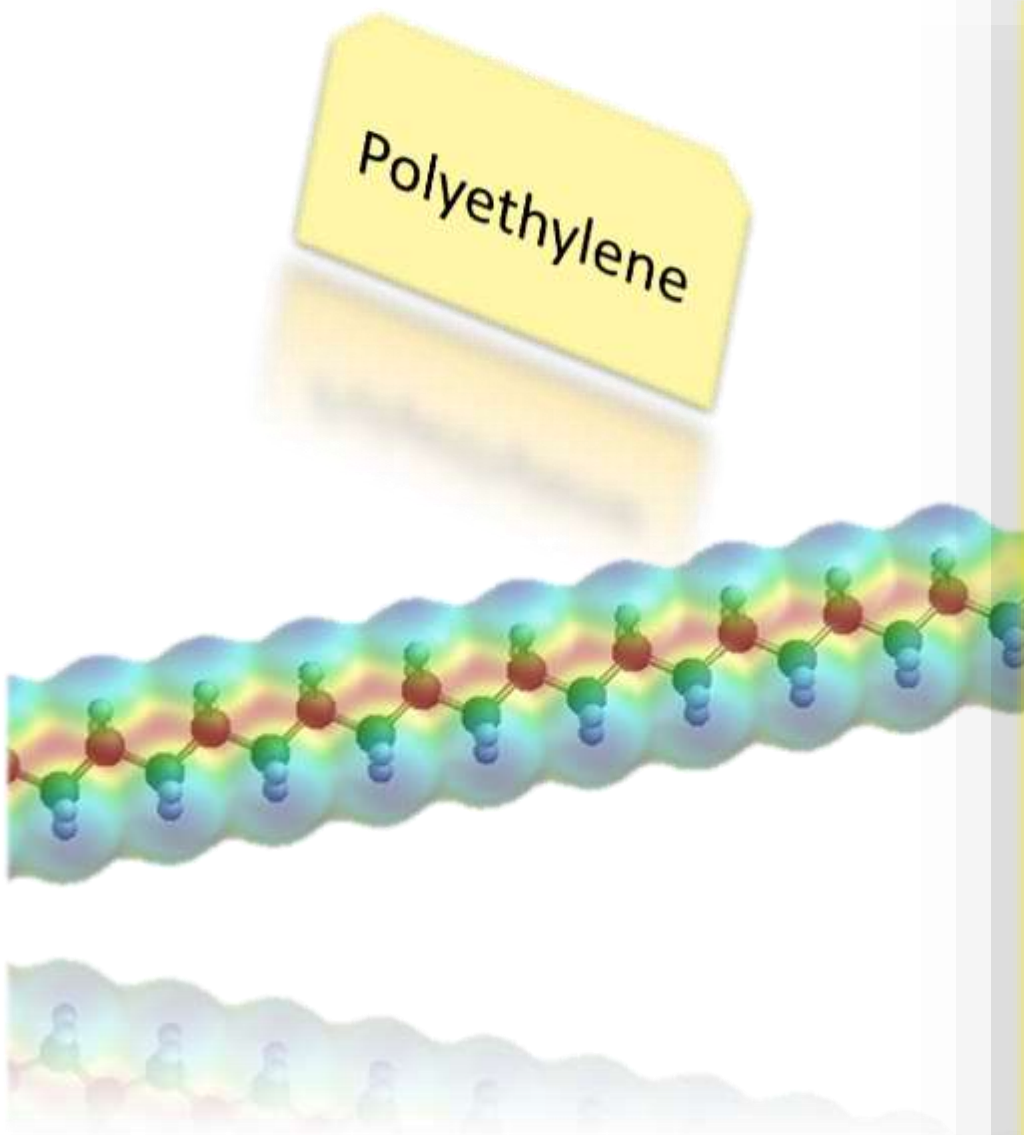
Polystyrene

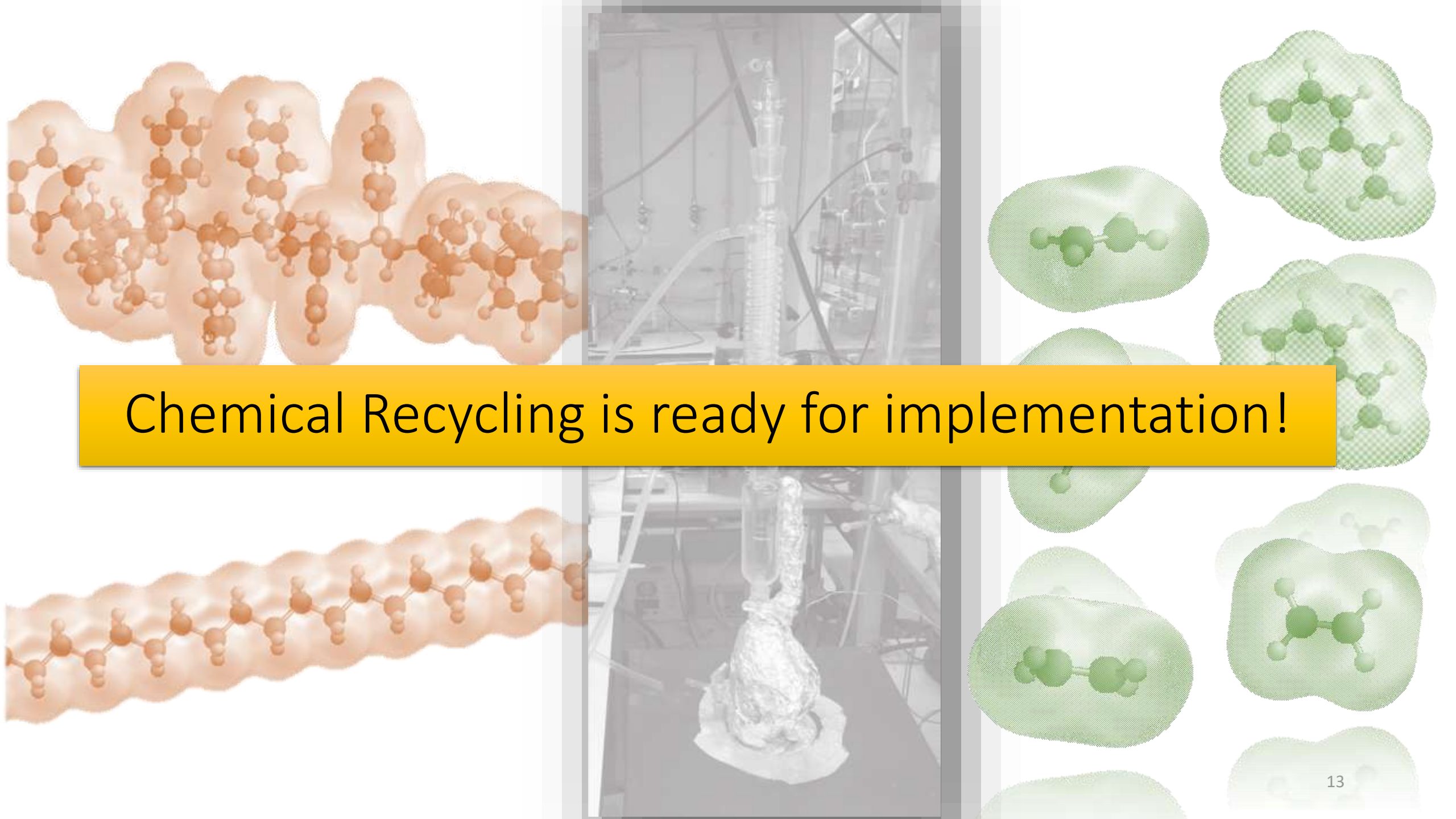


Styrene



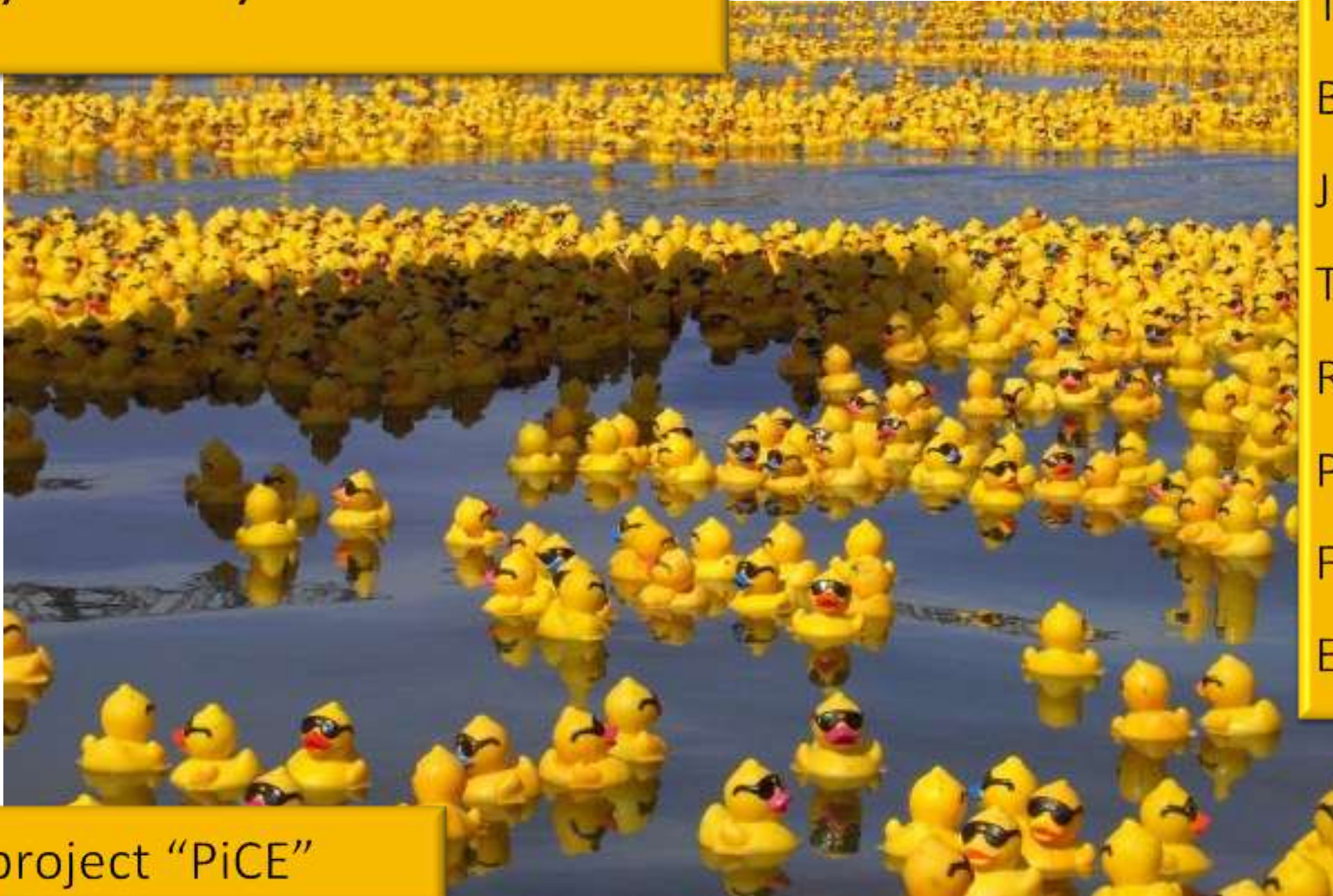
Research at CERENA





Chemical Recycling is ready for implementation!

Thank you for your attention



FCT project "PiCE"

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