A ‘Working Backwards’ Approach to Plastics

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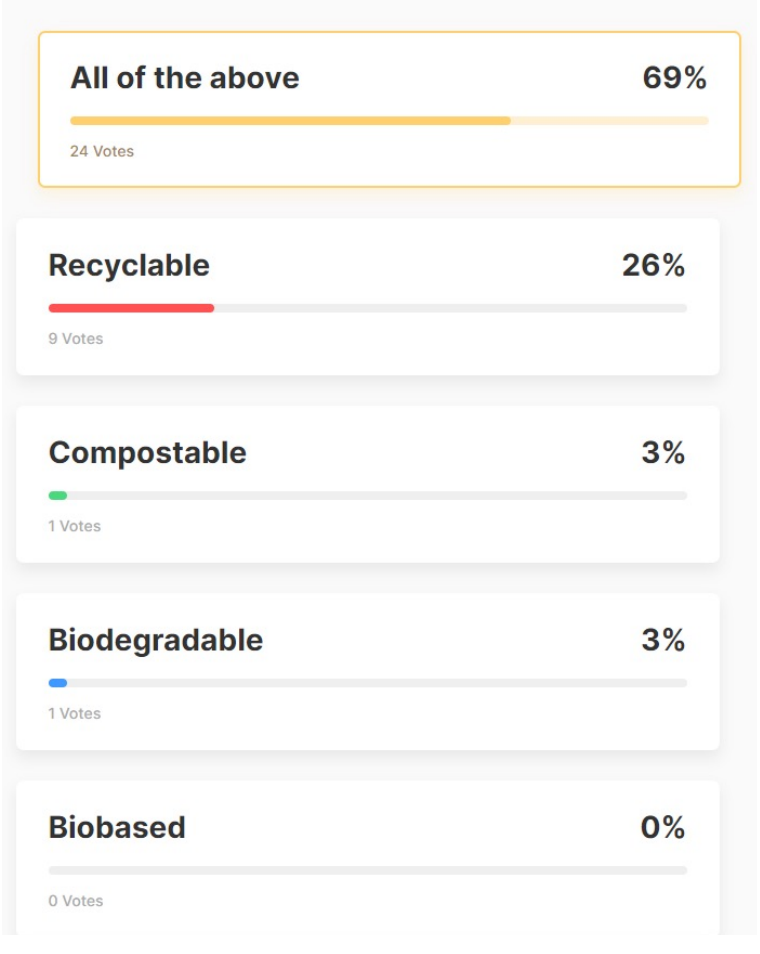
Net Zero Science and Innovation

sustainability

Should plastics be:

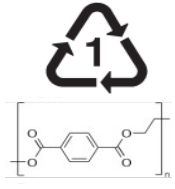
- ○ Recyclable
- ○ Compostable
- ○ Biobased
- ○ Biodegradable
- ○ All of the above



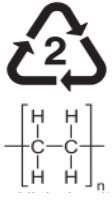
Today's Plastics

- Recyclable
- ~~Compostable~~
- Biobased
- ~~Biodegradable~~

PET

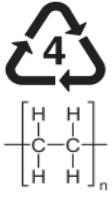


HDPE

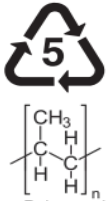


PVC

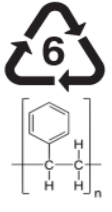
LDPE



PP

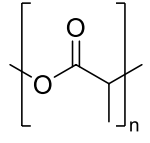


PS

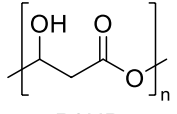


Emerging '*Polyester*' Plastics

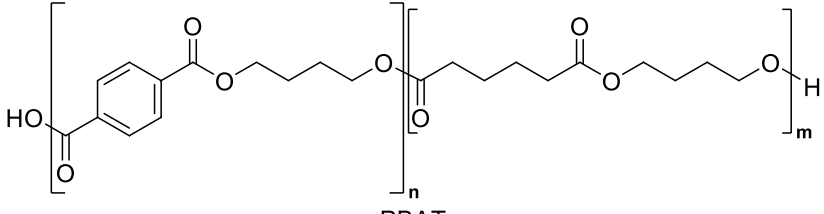
- Recyclable
- Compostable
- Biobased
- Biodegradable



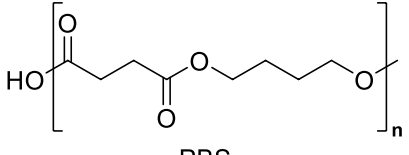
PLA



P3HB



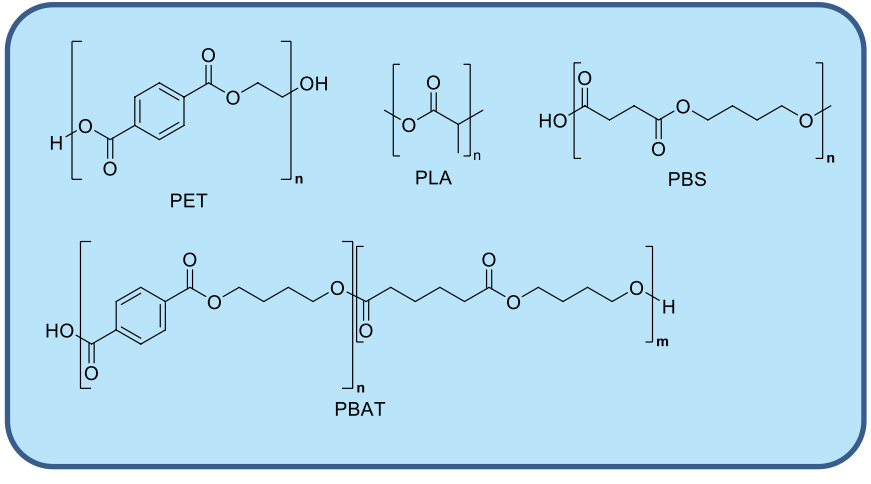
PBAT



PBS

Recycling mixed ‘polyesters’

Plastics with ester-linkages



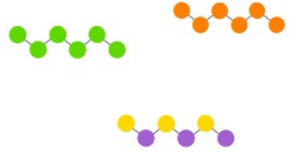
Applications will require multi-materials / blends

Deconstruction

Separations

Reconstruction

Recycled Polyesters



Recycling single-stream of mixed '*polyesters*'

Lower-value PET that is under-recycled today can enable initial volumes (e.g. thermoforms)

Polymer Type	Annual Production (tonnes)
PLA	457,380[1]
PBAT	464,640[1]
Mater-Bi	150,000[2]
PBS	84,350[1]
PHA	43,560[1]
PET (bottle, film, and packaging)	34,500,000[3]
PBT	1,300,000[3]

Emerging *polyesters* that are biobased and biodegradable can increase in volume over time

1 – European Bioplastics (2020)
2 – Novamont Website (2021)
3 – IHS Markit (2020) – does not include textiles/filament.

Recycling capability becomes platform for new materials

bottle
changing the way we recycle
U.S. DEPARTMENT OF ENERGY

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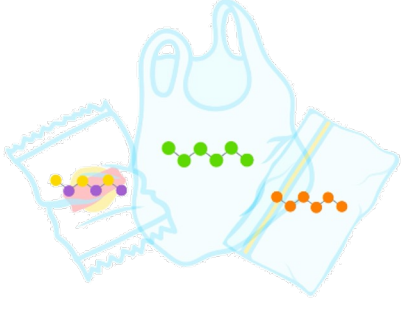

Mixed Polyesters

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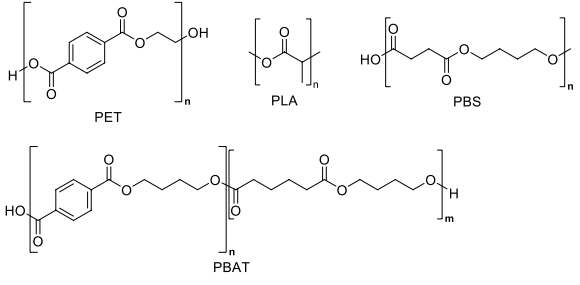
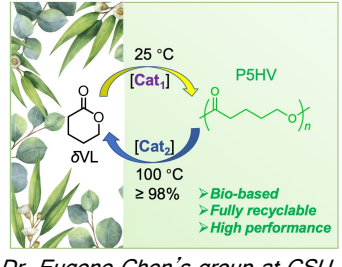
WHOLE FOODS MARKET

Existing polyesters



New polyesters



Dr. Eugene Chen's group at CSU

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