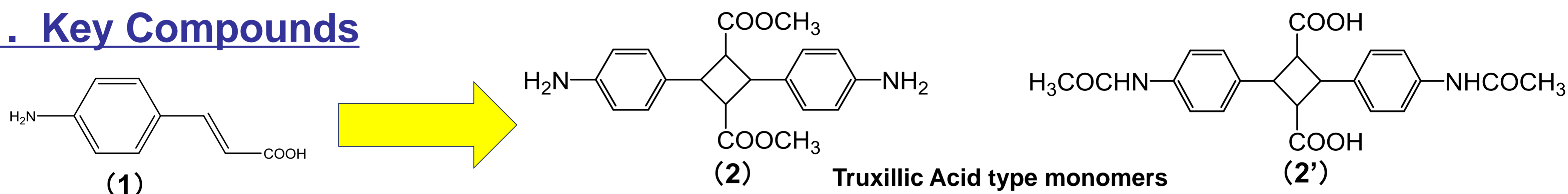


Superstrong & Transparent Films

Novel Polymer Films with Excellent Transparency, High Tensility, Good Heat Resistance

Prof. Tatsuo KANEKO (Japan Advanced Institute of Science and Technology)

1. Key Compounds

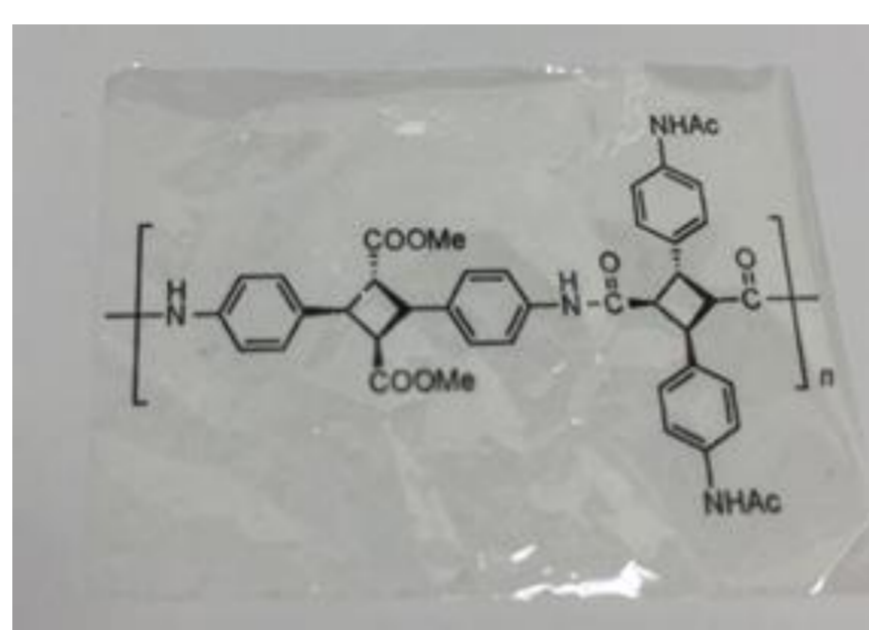
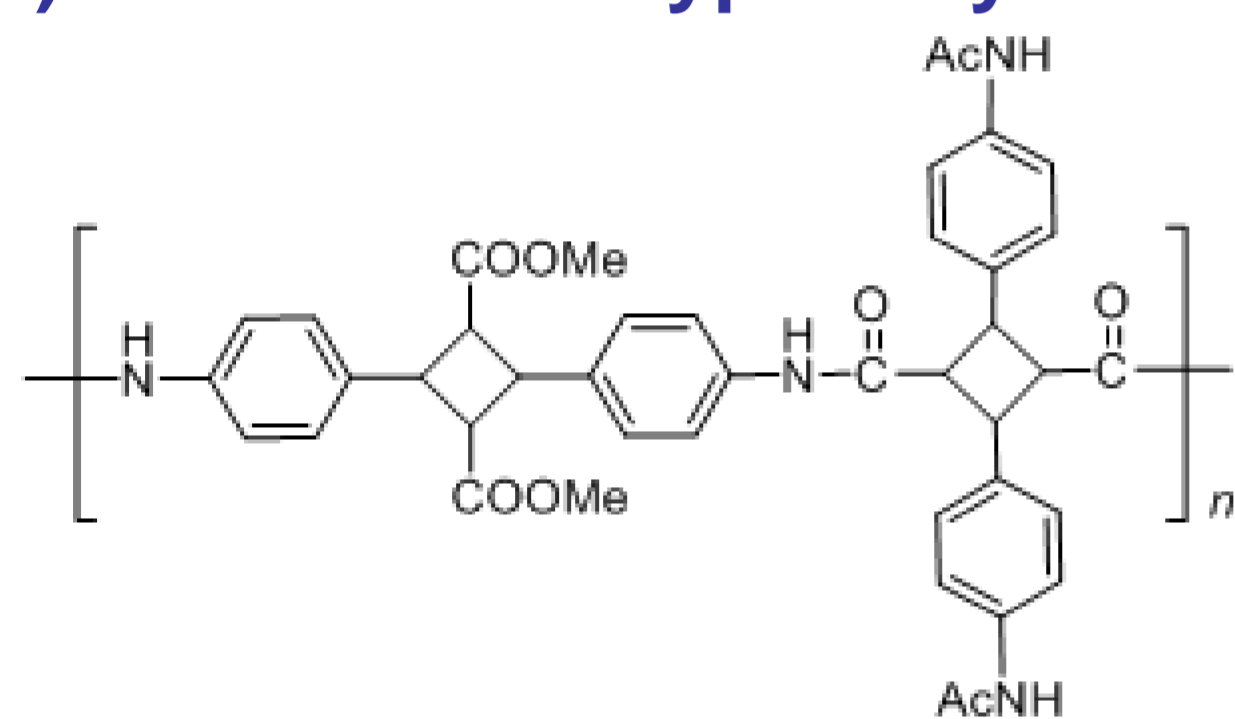


Superstrong and transparent bioplastics are generated from fermented microbial monomers.

- 4-aminocinnamic acid (1) was prepared from a biomass using recombinant bacteria.
- Diacid and diamino monomers that were both characterized by a rigid α -truxillate structure (2) (2') were generated by photochemical reaction.

2. Our Polymer Films —Excellent Transparency, High Tensility, Good heat resistance

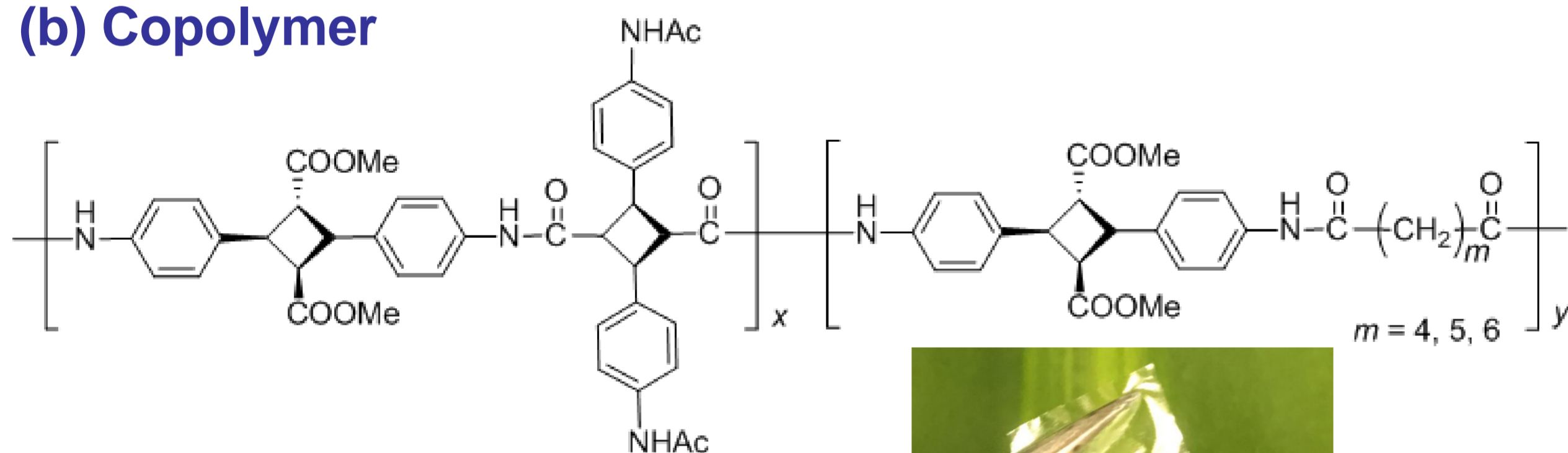
(a) Truxillic Acid type Polymer



Highest thermomechanical properties as amorphous films

Glass transition temp $T_g = 273^\circ\text{C}$
 10% weight loss temp $T_d = 370^\circ\text{C}$
 Young's modulus $E = 11.6 \text{ GPa}$
 Maximum stress $\sigma = 356 \text{ Mpa}$
 Transparency $93\% (336\text{nm})$

(b) Copolymer

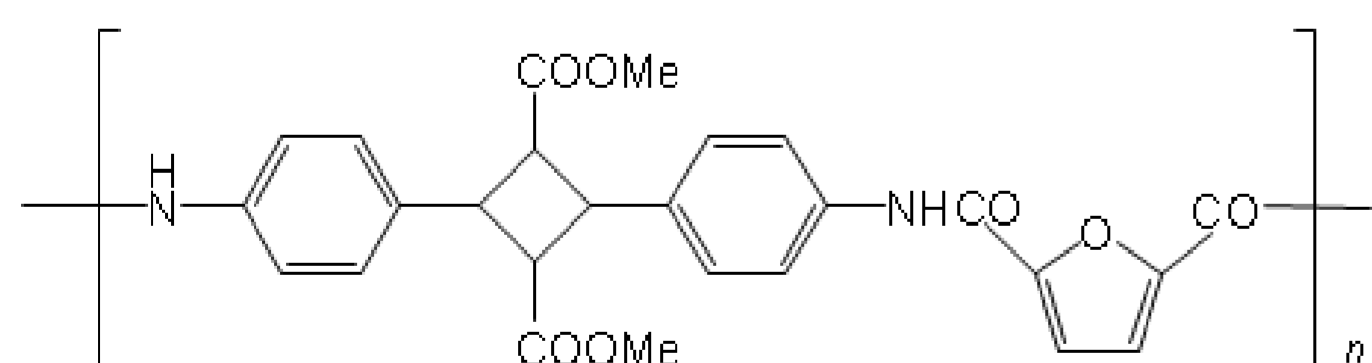


Equivalent strength as high-tensile steel

Glass transition temp $T_g = 243^\circ\text{C}$
 10% weight loss temp $T_d = 359^\circ\text{C}$
 Young's modulus $E = 12.1 \text{ GPa}$
 Maximum stress $\sigma = 407 \text{ Mpa}$
 Transparency $87\% (373\text{nm})$

- * High-tensile steel ($\sigma \approx 400 \text{ Mpa}$)
- * Pure iron ($\sigma \approx 250 \text{ Mpa}$)

(c) Furan diacid type polymer

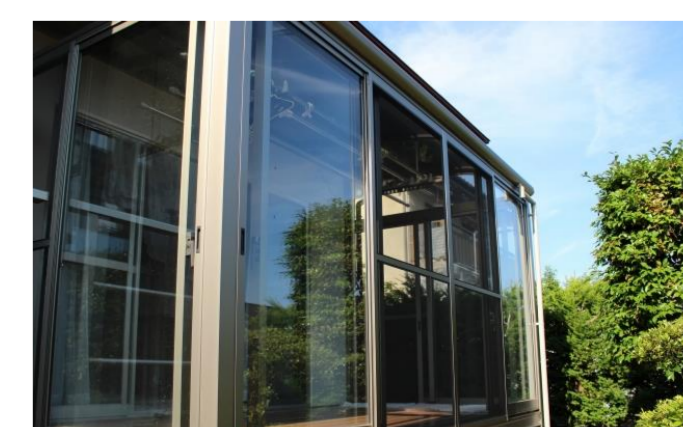


Glass transition temp $T_g = 198^\circ\text{C}$
 10% weight loss temp $T_d = 355^\circ\text{C}$
 Young's modulus $E = 8.0 \text{ GPa}$
 Maximum stress $\sigma = 163 \text{ Mpa}$
 Transparency $81\% (391\text{nm})$

3. Prospective Applications

Our excellent transparent, high tensile, good heat resistance polymers use as...

- glass substitute material
- body materials of automobile and aircraft



4. Patent Licensing Available

Patent No.: WO2013/073519 Patent Family

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