

# Water-Soluble Polyimides



**Polymers interconverting high water soluble and water insoluble.**

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## 1. Background

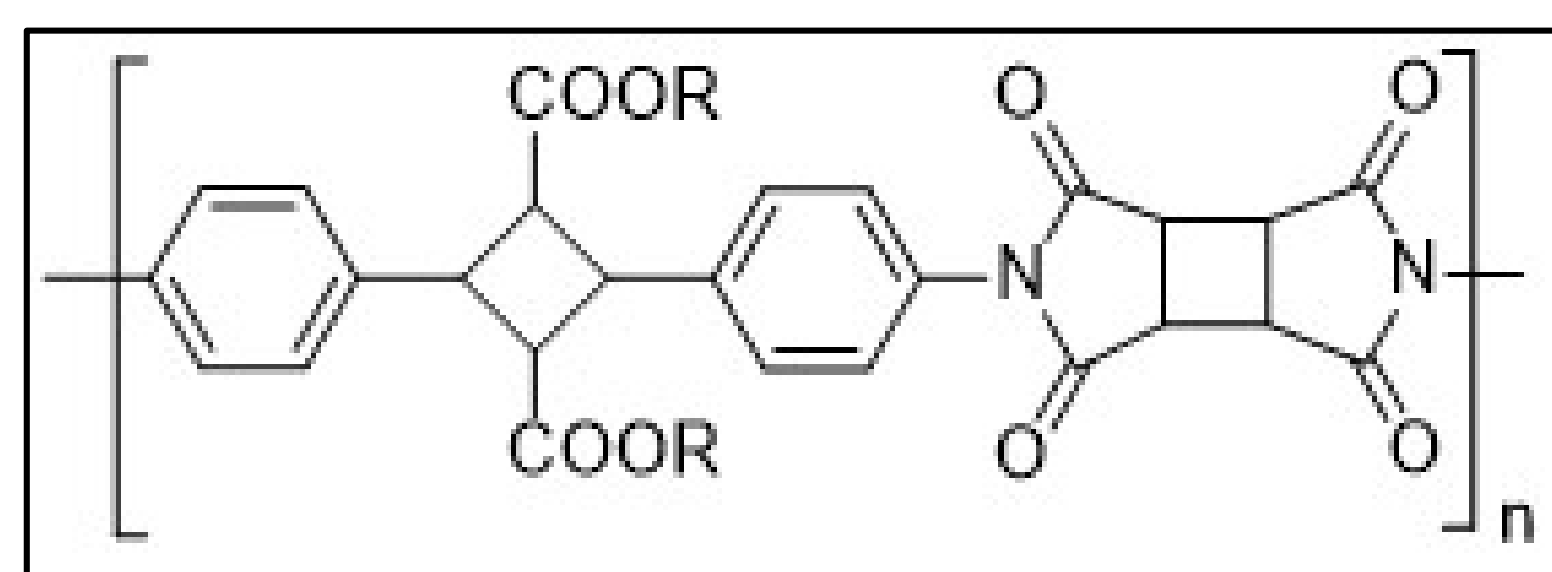
- In order to realize Sustainable Society, the following things for polymers are required.
- (1) Reduction of petrochemical resources
- (2) "Solvent free" production process

## 2. Our Technology

### (1) Original Invention :

We succeeded in producing "new Polyimides", which have the advantages listed below;

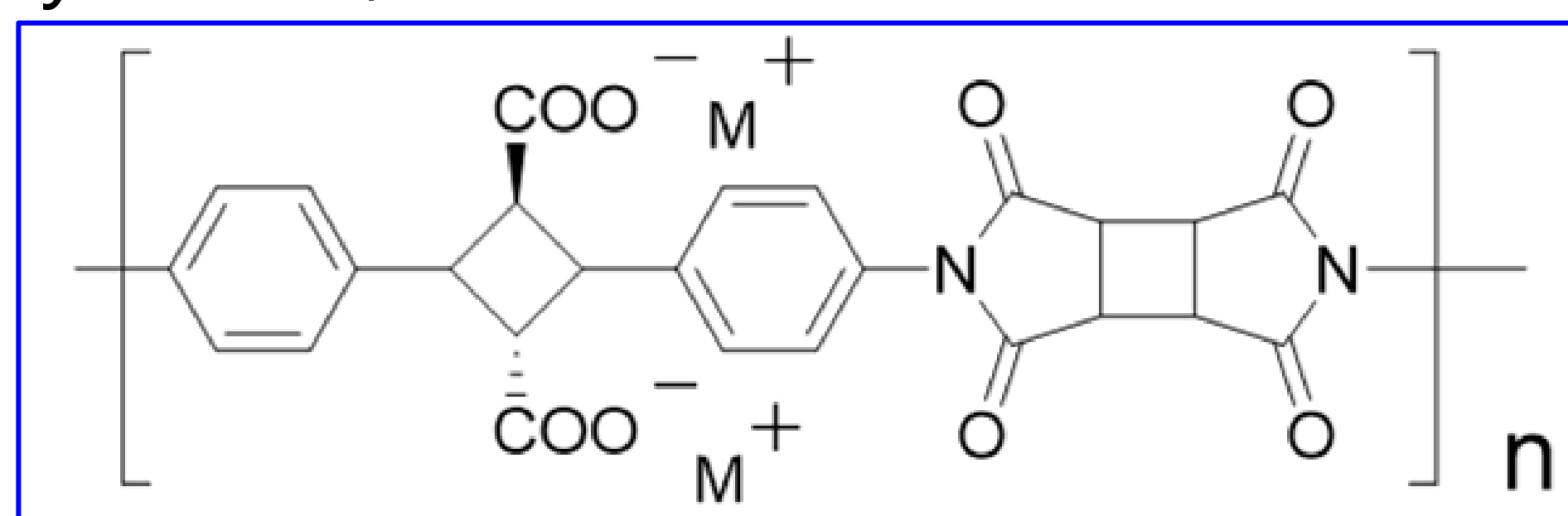
- High physical strength
- High heat resistance
- Transparency
- Recyclability owing to photodegradability
- Production ability from bio-resources



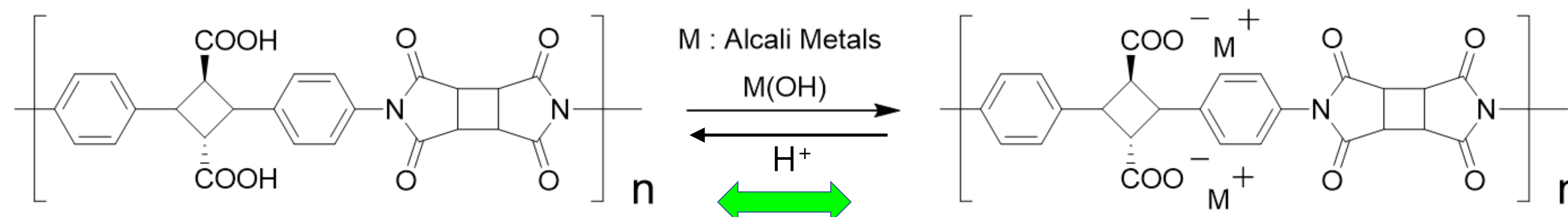
Although the "new polyimides" have several good points, they have disadvantages of "no organic solvent for casting" and "requiring complicated production process".

### (2) Enhanced Invention :

We succeeded in producing "enhanced new polyimides", which eliminate the disadvantages



## 3. Experiments



**H type : Water Insoluble**

**Salt type : Water Soluble**

**High physical property**

**Very high water-solubility (>66wt%)**

**Comparable properties "ester type"**

**Reduced environmental load**

[ Physical properties ]

(2) Enhanced Invention

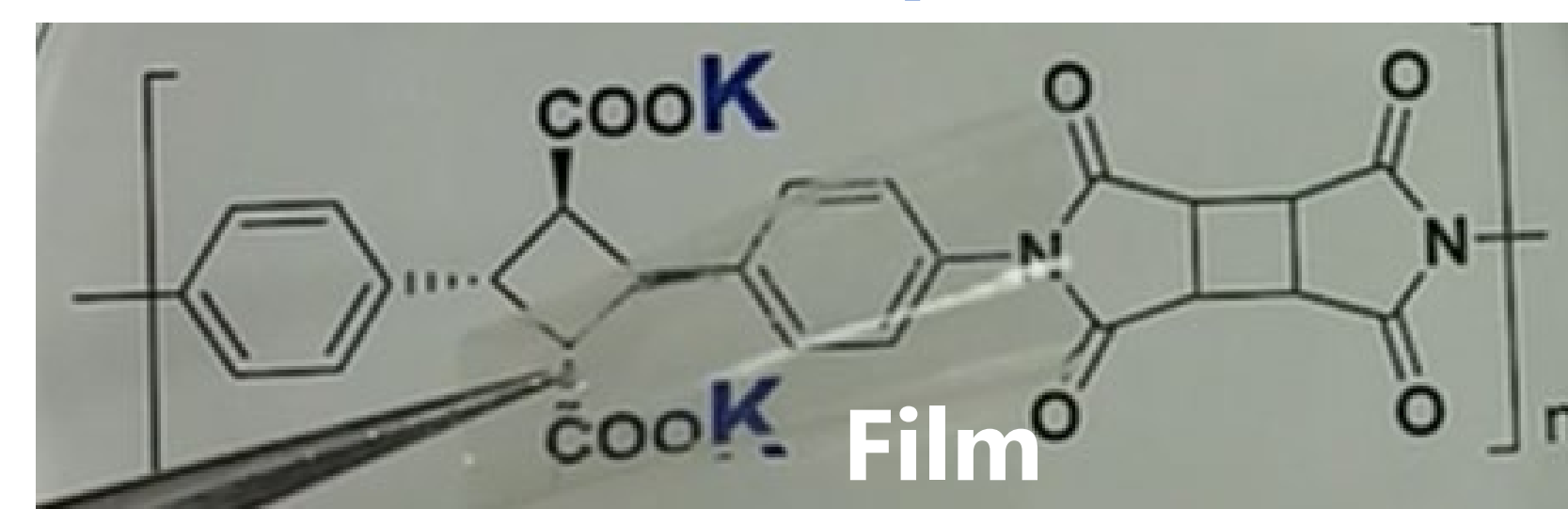
(1) Original Invention

Counter cations (M)	$T_{d10}$ (°C)	Strength at break (MPa)	Elongation at break (%)	Transparency (%T @450nm)
H type	406	109	3.6	90.0
Li	366	42	8.1	90.0
Na	352	37	10.1	89.0
K	362	29	10.9	90.1
Me	390	94	1.8	99.0

## 4. Application Example

■ Electrode materials (for Lithium ion battery etc.)

■ Soft materials (for 3D-Printer etc.)



## 5. Patent Licensing Available

Patent No.: WO2019 / 026795 (US, EP, CN, JP, KR)

WO2013 / 073519 (US, EP, CN, JP)

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