Biomass-Derived Polymers And Copolymers Incorporating Monolignols And Their Derivatives

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SUMMARY

UCLA researchers in the Departments of Bioengineering, Chemistry and Biochemistry have developed a novel synthetic strategy for the fabrication of biomass-derived polymers incorporating underutilized lignin derivatives.

BACKGROUND

Polyamide polymers and benzoxazine resins are important materials used in a wide variety of products and manufacturing including the automotive, plastics, and nylons industries. Current methods to produce these polymers and resins utilize a diminishing supply of petroleum-based chemical precursors. While there has been some work identifying biomass-derived materials, they are typically mechanically weaker or have a reduced material lifespan. As the only natural aromatic polymer source, lignin could replace petroleum-derived aromatics in the synthesis of aromatic-based commodity polymeric materials.

INNOVATION

- Use of biomass-derived reagents for the creation of polyamide polymers, co-polymers, and resins
- Polymers fabricated through their new synthetic route incorporate underutilized chemicals derived from renewable lignocellulosic biomass feedstocks

APPLICATIONS

Monolignol-based polyamide polymers

- Textiles (e.g. nylons, Nomex, and Kevlar)
- Bioplastics

Monolignol-based polyamide graft co-polymers of itaconic acid and Tulipalin A

- Flocculants to remove heavy metals from solution
- Water remediation and processing
- Highly absorbent polymers

Monolignol-based benzoxazines and polybenzoxazines

- Thermoset resin
- Mechanical and structural resin

ADVANTAGES

This technology utilizes biomass to generate polymers with properties similar to commercially available materials.

STATE OF DEVELOPMENT

Researchers have detailed methods and synthetic schemes for the fabrication of these polymers. Additionally, these polymers have been characterized as having moderate molecular weight and polydispersity, as well as moderately thermostable.

PATENT STATUS

Country	Type	Number	Dated	Case

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OTHER INFORMATION

KEYWORDS

Polyamide polymers, monolignol polymers, monolignol polyamines, monolignol co-polymers, co-polymers, graft co-polymers, lignin polymer, lignin, monolignol benzoxazines, benzoxazines, polybenzoxazines, thermoset resin, nylon, Kevlar, Nomex, aramid

CATEGORIZED AS

- **Biotechnology**
  - Industrial/ Energy
- **Environment**
  - Remediation
- **Materials & Chemicals**
  - Biological
  - Composites
  - Polymers
  - Textiles

RELATED CASES

2016-252-0

Germany	Issued Patent	60 2016 090 532.9	12/04/2024	2016-252
France	Issued Patent	3362439	12/04/2024	2016-252
United Kingdom	Issued Patent	3362439	12/04/2024	2016-252
United States Of America	Issued Patent	10,941,104	03/09/2021	2016-252

RELATED MATERIALS

- Strategies for the Conversion of Lignin to High-Value Polymeric Materials: Review and Perspective Chem Rev. 2016 Feb 24;116(4):2275-306. doi: 10.1021/acs.chemrev.5b00345. Epub 2015 Dec 14.

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