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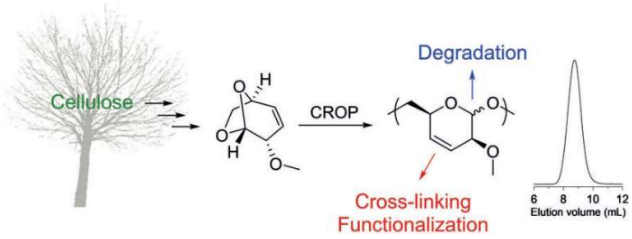
Cellulose derived novel bioplastic

Description

This bioplastic is the first polymerization of levoglucosenyl methyl ether (LME), derived from sustainable feedstock (cellulose), and developed in the research group of Prof. Helmut Schlaad. LME is obtained from levoglucosenone, a pyrolysis of cellulose, by reduction and subsequent methylation and is polymerized by cationic ring-opening polymerization (CROP) to produce a **semicrystalline thermoplastic** unsaturated polyacetal. The double bonds along the chain can undergo hydrogenation and thiol-ene reactions as well as crosslinking, thus making this polyacetal interesting as a **reactive functional material**.



Details

- Semicrystalline thermoplastic
- Glass transition at ~35°C
- Melting transitions at 40–120 °C
- Thermally stable up to ~220 °C
- Apparent molar mass up to ~36 kg mol^{-1}
- Dispersity ~1.4
- Near quantitative conversion during polymerization.
- Soluble in DCM, chloroform, tetrahydrofuran (THF), and acetonitrile
- Insoluble in diethyl ether, dimethyl sulfoxide (DMSO), methanol, and water
- Current yield: lower gram scale.

Developmental status

- Future research aim: **generate a platform of reactive and degradable (co-)polyacetals or complex macromolecular architectures**.
- Active research:
  - Development of the properties of the bioplastic
  - Optimise the reaction to achieve a living/controlled (co-) polymerization

Scientific literature

- doi:10.1002/anie.201908458

Applications

- Plastic manufacturing
- Medical devices
- Automotive
- Electrical & electronic
- Industrial
- Drug Delivery

Keywords

- Polymer Chemistry
- Biomaterials
- Bioplastic
- Thermoplastic
- Sustainability
- Reactive functional material

Interest in cooperation

- Research cooperation

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