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A Polymer Transistor-based Chemical Sensor Functionalized with a Molecularly Imprinted Polymer for a Chiral OTC Drug

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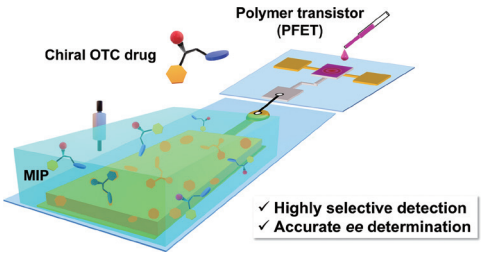
Molecular imprinting is a technique for obtaining a three-dimensional molecular recognition network against a specific analyte, which allows optimal designing for selective analyte detection considering molecular geometry. In this study, the author designed a polymer field-effect transistor sensor with a molecularly imprinted polymer (MIP-PFET) for a tropane drug.[1)] From the perspective of pharmaceutical chemistry, the development of versatile chemical sensors to determine the enantiomeric purity of over-the-counter (OTC) drugs is important because of their side effects and different pharmacological activities depending on their chirality. Based on the elaborate design of MIP, the fabricated MIP-PFET succeeded in the sensitive and selective detection of the tropane drug and the determination of enantiomeric excess of the OTC drug.

Polymer Preprints, Japan, **71**, 3J04 (2022)



Effect Verification of Additives for Bio-based Polylactic Resin Searched by Use of Chemicals Informatics Based on Public Literature Data

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Recently, in the manufacturing industry, application of biobased resins to their products are required due to growing demand for carbon neutrality. In this study, the additives that improve the strength and biodegradability of biobased polylactic acid (PLA) resins were extracted by utilizing Chemicals Informatics (CI), which search promising materials from public literature data, developed by Hitachi High-Tech Solutions. The improvement effect was clarified from the mechanism using molecular simulation and experimentally verified by making PLA resin containing the promising additives extracted from CI. This technology is expected to expand the use of biobased resins, and it can also contribute to the realization of a circular economy society by applying of general-purpose resins to easy-to-dismantle technology.

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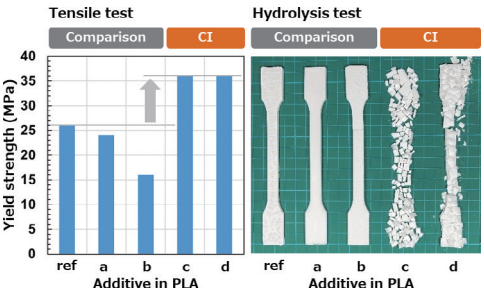

Fig. Yield strength and hydrolyzability of polylactic acid resin with no additives (ref), (a) isophthalic acid, (b) terephthalic acid, (c) adipic acid, and (d) 3,3'-dithiodipropionic acid.

Evaluation of Mechanical Properties Exhibited by Host Molecule-Modified Polydimethylsiloxane Materials

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Polydimethylsiloxane (PDMS) is one of promising materials because of their biocompatibility and chemical stability. Despite these advantages, practical use of PDMS materials has been limited due to their weak mechanical properties. In this study, we attached triacetylated γ-cyclodextrin (TAcγCD) molecules onto the PDMS main chains to prepare tough PDMS elastomers. The attached TAcγCD formed topologically movable cross-links by sliding along the PDMS polymeric chains. The TAcγCD movable cross-links improved Young's modulus values of the PDMS elastomers. In particular, with an appropriate TAcγCD content (~2 mol%), both mechanical toughness and the Young's modulus values significantly improved compared with those of PDMS elastomers cross-linked by chemical bonds. Effective energy dissipation and relaxation behaviors contributed to the improvement.

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