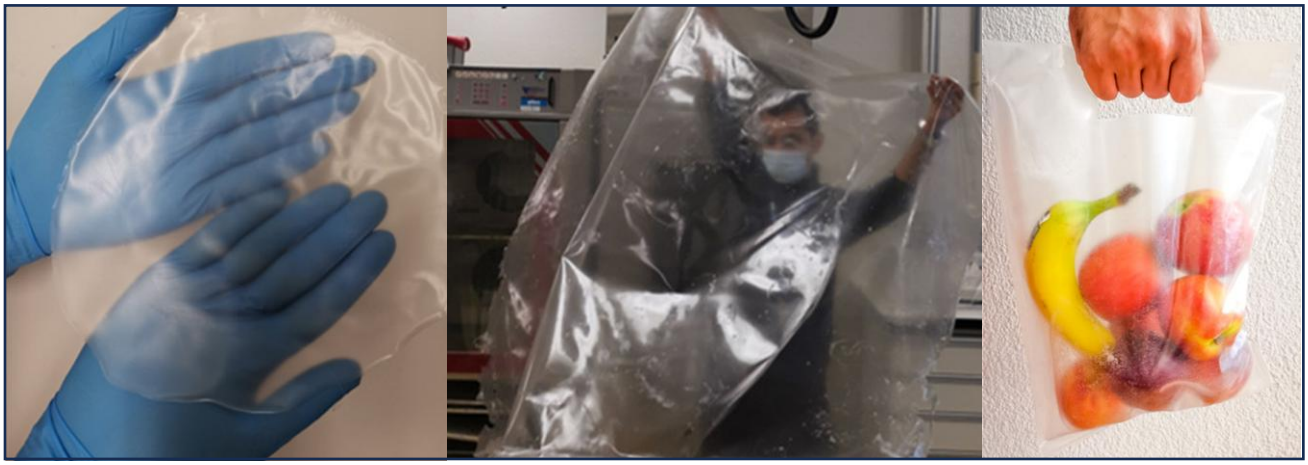
ETH zürich

Licensing Opportunity

Bioplastic for packaging materials



Application

This protein-based bioplastic is an eco-friendly alternative to conventional plastics. The material is ideal for single-use food packaging. In hybrid paper bags the transparent and flexible films serve as a window for product presentation. In layered hybrid packaging, the film adds a moisture barrier. The bioplastic is disposed as wastepaper, which eliminates the need for waste sorting.

Features & Benefits

- Food-sidestream-based and biodegradable
- Flexible, antioxidant, transparent / UV blocking
- Industrial scale-up: >1 km film (27 kg) from 500 L waste

Publication

- "Sustainable Bioplastics from Amyloid Fibril-Biodegradable Polymer Blends", ACS Sustainable Chem. Eng. 2021, 9, 11916−11926, https://doi.org/10.1021/acssuschemeng.1c03937
- " Industrial proof of concept from soy waste to bioplastics", Biomacromolecules. 2024, 25, 2033−2040, https://doi.org/10.1021/acs.biomac.3c01416
- Patent pending EP/US, WO/2022/238244

transfer

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Technology Readiness Level

1 2 3 4 5 **6** 7 8 9

Background

Protein based bioplastics attract attention due to their broad availability and fast biodegradation rates. Additionally, they can be classified as edible due to their food grade nature. Most bioplastics, however, do not present the best mechanical properties. They are brittle with low thermal stability and high permeabilities. The packaging industry would benefit from high-performance bioplastics for circular packaging to protect the wrapped goods and food.

Invention

The present invention introduces novel composite materials of amyloid fibrils and biodegradable polymers and the manufacturing method thereof.

Amyloid fibrils are obtained from valorized proteins from food-industry sidestreams, including soy whey, okara, oat, pea, rice, canola and whey sources. The components are processed in water-based dispersions, cast or coated onto a substrate, dried and slit into self-standing films.

Recent industrial trials demonstrated roll-to-roll film production: 500 L of soy whey were processed into 27 kg of film, corresponding to more than 1 km in length and 0.5 m in width. The film was further processed into transparent windows for paper-based packaging prototypes.

The film can be laminated. Combinations with other substrates such as paper or cardboard open a way for further customized applications.

Paper and bioplastic can be disposed together as the bioplastic dissolves/disintegrates in the paper recycling process.