

TECH OFFER

Scalable and Cost-Efficient Next-Gen L-PGA Biopolymer



KEY INFORMATION

TECHNOLOGY CATEGORY:

Chemicals - Polymers **Chemicals** - Bio-based

Life Sciences - Industrial Biotech Methods & Processes

Personal Care - Cosmetics & Hair

Materials - Bio Materials

TECHNOLOGY READINESS LEVEL (TRL): TRL4

COUNTRY: JAPAN

ID NUMBER: TO175425

OVERVIEW

The growing challenge of plastic waste and non-biodegradable absorbent materials is driving demand for bio-based alternatives that deliver performance without utilisation of petrochemicals. Poly- γ -L-glutamic acid (L-PGA) stands out as a biodegradable, biocompatible biopolymer with exceptional water retention and film-forming properties, making it highly relevant to applications requiring such functionalities. Commercial adoption has been limited as most commercial PGA is DL-PGA (a racemic polymer with lower stereoregularity and less predictable chemistry) while the preferred L-PGA grade remains scarce and costly under the single supplier archaea-based production route.

This technology offers a cost-efficient and scalable platform for L-PGA production. Using proprietary microbial strains, it can produce consistent, ultra-high molecular weight L-PGA with stable quality and stereoregular purity. The resulting stereoregular L



isomer material enables early adoption in cosmetics/personal care and medical materials, with the potential to expand into biobased superabsorbent polymers (SAPs) and bioplastics as production capacity increases.

To accelerate market adoption and tailor application-specific L-PGA grades, the technology owner seeks co-development and scale-up partners for this L-PGA technology (current readiness is at bench-scale, with next steps focused on jar-bioreactor scale-up and standardized testing).

TECHNOLOGY FEATURES & SPECIFICATIONS

- Strain engineering (plasmid2free): Genome2integrated L2PGA pathway in GRAS Bacillus subtilis, with targeted metabolic/regulatory edits for robustness and titer
 - Delivers ultra@high@molecular@weight L@PGA and supporting long@run stability.
- Cost2optimised synthetic medium: Chemically defined, low2cost medium that maintains product purity and simplifies
 downstream processing
 - Achieves a material reduction in cultivation?medium cost versus archaea?based production
- Product format & suitability: Homochiral Lissomer polymer supplied as watericlear solutions; suited to hydrogels/adhesives, cosmetic ingredients, and bioplastics/coatings.
 - Samples and prototypes can be colldeveloped with partners for gradelspecific validation

Scale@up and process development are advancing through two complementary approaches. Conventional liquid culture is advancing toward pilot for process and product validation. In parallel, an energy@efficient route—engineered filamentous cells immobilised on a thin@filter carrier—is under R&D. This design aims to overcome viscosity limits, improve oxygen transfer, and support high-density continuous production with reduced aeration and agitation energy requirements.

POTENTIAL APPLICATIONS

• Cosmetics and Personal Care

As a biodegradable, biocompatible moisturising/film?forming ingredient, L?PGA can be used in serums, creams, sheet masks and hair/scalp care.

Medical materials

Serves as a platform for wound? healing hydrogels and tissue adhesives/surgical glues, as well as drug? delivery or regenerative scaffolds.

• Hygiene products

L-PGA can be used as bio? based SAP grades for diapers and feminine/personal hygiene, offering high water uptake and salt? tolerant absorbency with the added advantage of biodegradability.

• Bioplastics & coatings/films

L?isomer stereoregularity supports tougher, more predictable networks for bioplastic resins, barrier coatings, and flexible films that can reduce reliance on petroleum?derived additives.



UNIQUE VALUE PROPOSITION

- High quality L-PGA consistently produces the all-L isomer with predictable chemistry and superior performance
- Cost-competitive the proprietary microbial platform lowers production costs significantly
- Scalable and industrially ready this technology is compatible with standard bioprocesses, advancing to pilot scale with parallel R&D in continuous, energy-efficient cultivation.