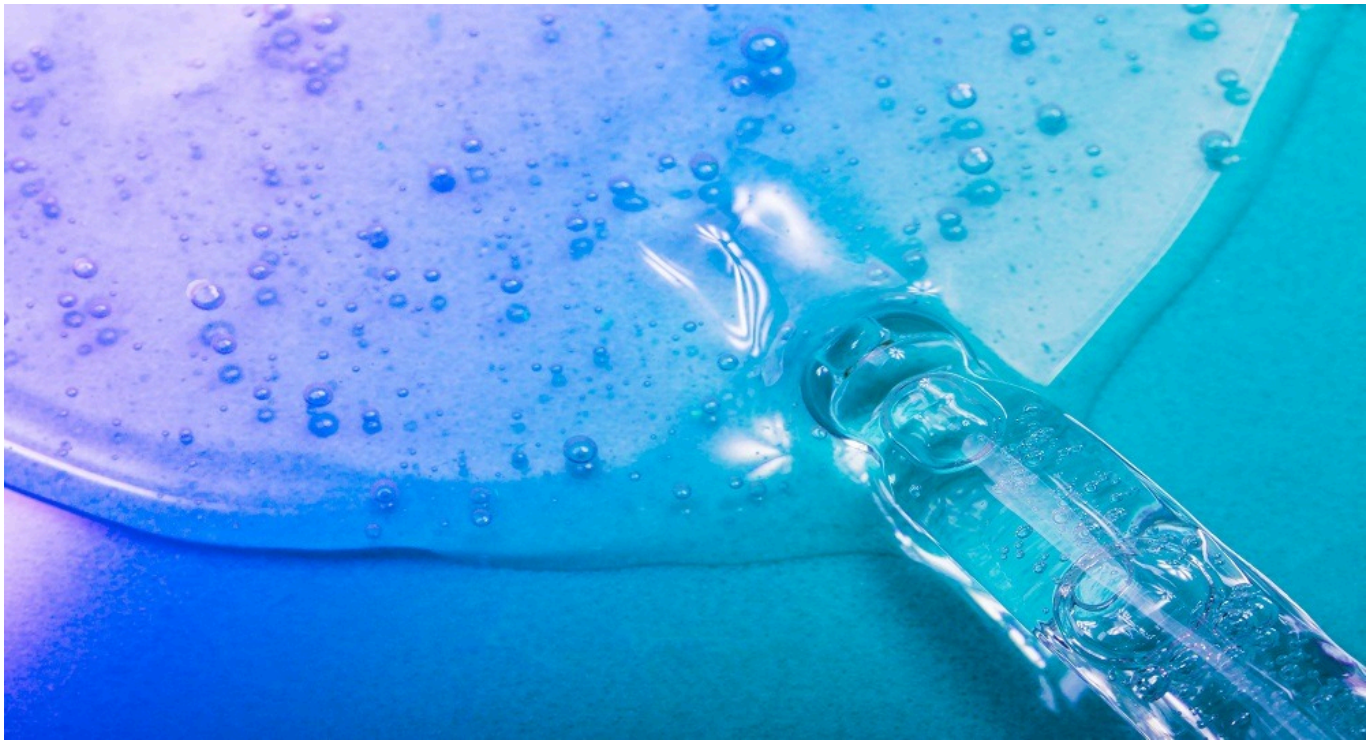
TECH OFFER

# 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 bio-based 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 (plasmid□free): Genome□integrated L□PGA 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.
- Cost□optimised synthetic medium: Chemically defined, low□cost 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 L□isomer polymer supplied as water□clear solutions; suited to hydrogels/adhesives, cosmetic ingredients, and bioplastics/coatings.
    - Samples and prototypes can be co□developed with partners for grade□specific 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.