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Sucrose Benzoate (CAS 12738-64-6)
Fully Bio-Based Plasticizer for Polyhydroxyalkanoates (PHA)

1. Product Identification

Chemical name	Sucrose Benzoate
CAS number	12738-64-6 *(may vary depending on degree of substitution)*
Chemical family	Aromatic ester of sucrose
Origin	Bio-based (sucrose and benzoic acid)

2. Product Classification
Sucrose Benzoate is classified as a high-molecular-weight, bio-based plasticizer designed for use in biodegradable and bio-polyester systems where low volatility and reduced migration are required.

3. Intended Function in Polymers

Flexibility modifier	It is not intended as a reactive modifier or chain extender.
Plasticizer	Tg-reducing additive
Toughness enhancer	

4. Target Polymer Systems

Cellulose Acetate (CA)	Polybutylene Succinate (PBS)
Polyhydroxyalkanoates (PHB, PHBV, PHBH)	Polylactic Acid (PLA)
Primary focus in this article: PHA systems	

5. Mechanism of Action
PHA polymers, particularly PHB, exhibit high stiffness and brittleness due to strong intermolecular interactions and high crystallinity.

Sucrose Benzoate introduces:
Multiple aromatic ester groups, and residual hydroxyl functionality from the sucrose backbone.These structural features increase free volume within the polymer matrix, reduce intermolecular bonding forces, and lower the glass transition temperature (Tg). The result is improved flexibility and melt processability. Due to its relatively high molecular weight and aromatic structure, Sucrose Benzoate demonstrates low volatility and limited migration compared with low-molecular-weight plasticizers.

6. Compatibility Considerations in PHA
Compatibility depends strongly on the PHA grade:

PHB:
- High crystallinity
- Requires higher plasticizer loading (typically ~10–20 wt%)

PHBV / PHBH:
- Increased amorphous content
- Improved miscibility and more efficient plasticization
- Uniform dispersion through controlled melt mixing is essential to avoid phase separation at higher loadings.

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7. Performance Expectations

When properly incorporated, Sucrose Benzoate is expected to deliver:

- Reduction in glass transition temperature
- Increased elongation at break
- Moderate reduction in modulus
- Improved toughness without significant plasticizer migration
- Exact performance is formulation-dependent and must be validated through trials.

8. Comparison with Conventional PHA Plasticizers

Plasticizer	Compatibility	Migration	Key Notes
ATBC	Very good	Moderate	Widely used reference plasticizer
PEG-400	Limited	High	Moisture sensitivity
Isosorbide diacetate	Very good	Low	High thermal stability
Sucrose Benzoate	Good	Very low	Bio-based, low volatility

Sucrose Benzoate offers a balance between bio-based content and migration resistance, rather than maximum plasticization efficiency.

9. Thermal and Processing Stability

- Demonstrates good thermal stability within typical PHA processing windows
- Low volatility minimizes loss during extrusion or molding
- Suitable for applications requiring dimensional and mechanical stability over time

10. Recommended Evaluation Tests

To validate suitability in PHA formulations, the following tests are recommended:

Test	Purpose	Standard
DSC	Tg, Tm, crystallinity	ASTM D3418
Tensile testing	Strength, modulus, elongation	ASTM D882 / D638
TGA	Thermal stability	ASTM E1131
SEM / AFM	Phase morphology	Visual / microstructural

11. Commercial Availability and Limitations

Sucrose Benzoate is not yet a mainstream commercial plasticizer for PHA. Availability is currently limited, and grades suitable for consistent industrial processing may vary by supplier.
As such:

- It should be evaluated through controlled trials
- Not recommended as a drop-in replacement without validation
- Supply consistency must be confirmed prior to scale-up

12. Positioning Summary

- Sucrose Benzoate is best positioned as an emerging, fully bio-based plasticizer option for selected PHA systems, particularly PHBV and PHBH grades.

- Its key strengths lie in low migration, low volatility, and sustainability alignment rather than maximum plasticization efficiency.

- It is suitable for applications where long-term stability and bio-based content are prioritized, subject to formulation-specific validation.

Disclaimer

The information contained in this technical article is based on publicly available literature, laboratory data, and technical understanding available at the time of preparation. It is intended for general technical guidance only and does not constitute a specification, guarantee, or warranty of performance.

Actual product performance may vary depending on formulation design, processing conditions, polymer grade, and end-use requirements. Users are advised to conduct their own trials and evaluations to determine suitability for specific applications. Polymer Add Thailand Co., Ltd. accepts no liability for any loss, damage, or claims arising from the use or interpretation of the information presented herein.

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END OF REPORT