

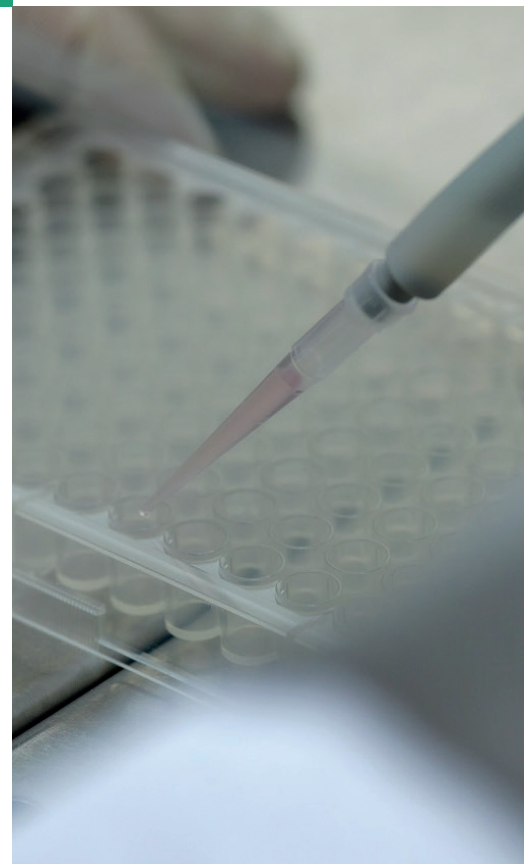


Evaluation of heat sealing of PLA microplates for the purpose of sample storage

Green Elephant[®]

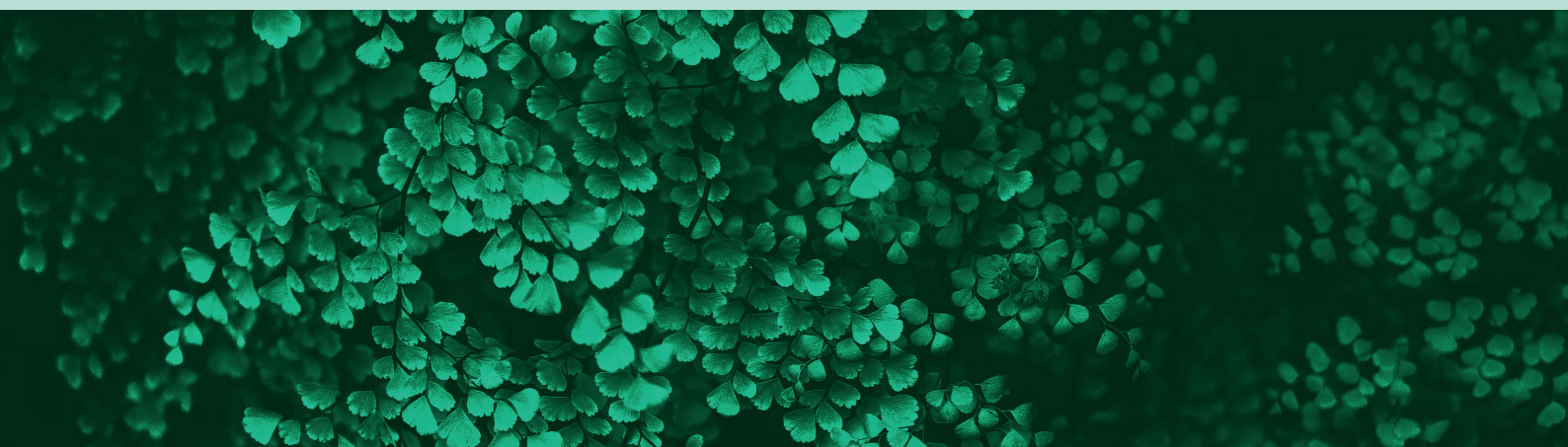
96-well microPLAte

Compatibility with heated plate sealing,
14-day period performance



Summary

- **Polylactic acid (PLA) is a plastic derived from corn starch.** When compared to oil-based plastics (such as polystyrene), PLA has a reduced lifetime environmental impact.
- **96-well plates, a commonly used laboratory plastic consumable,** are now available in PLA.
- Given the lower thermal operating temperature of PLA relative to polystyrene (PS), its compatibility with **heated plate sealing, a common method in biological sample storage,** requires careful evaluation.
- The study showed **effective plate sealing of the PLA plate,** with improved sealing performance when compared to PS over a 14-day period.



Heat sealing of polylactic acid (PLA) microPLAtes for sample storage

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1. Introduction

Reliable sample storage is essential to maintaining data integrity in high-throughput laboratory workflows. Heated plate sealing of 96-well plates provides a robust, reproducible method for securely enclosing samples, minimizing evaporation, preventing cross-contamination, and preserving analyte stability during short- and long-term storage. By applying controlled heat and pressure to compatible sealing films, laboratories can achieve uniform, hermetic seals across all wells, supporting consistent downstream performance in applications such as PCR, compound storage, and biochemical assays.

This application note evaluates the suitability of heated plate sealing for polylactic acid (PLA) microplates, a newer, bio-based alternative to conventional polystyrene plates. While PLA offers sustainability advantages and is gaining traction in laboratory settings, its reduced maximum operating temperature, approximately 50 °C compared to around 70 °C for standard polystyrene (PS), raises questions regarding compatibility with traditional heat-sealing processes. Because effective thermal sealing relies on controlled heat and pressure to achieve a uniform bond, the lower thermal tolerance of PLA may impact seal integrity or plate performance.

Accordingly, this study investigates whether PLA microplates can withstand heated plate sealing conditions while maintaining structural integrity and reliable sample protection comparable to polystyrene plates. It is also worth noting that, in previous work, PLA microplates were shown to be suitable for ultra-low temperature storage at -80 °C — a condition for which polystyrene plates are generally not recommended, with polypropylene (PP) typically used as the preferred alternative. This previously demonstrated cryogenic compatibility further highlights the versatility of PLA microplates across a broader range of storage conditions.

2. Method & Results

Scientists at BioAscent, a UK-based CRO with extensive expertise in de novo assay development and optimization of bespoke assays, compared the integrity of 96-well PLA plates (Green Elephant) versus traditional PS plates (Thermo Scientific) under heat sealing. An Agilent PlateLoc sealer and Azenta Life Sciences DMSO Resistant Peelable Heat Seal (cat# PCR0860) were used to heat seal both sets of plates.

With plate sealing settings of 175 °C and 2.5 seconds, the PLA plates showed signs of thermal distortion. The temperature was reduced to 160 °C and after 2.5 seconds, no thermal distortion was observed (Figure 2).



Figure 1: Agilent PlateLoc sealer used in this study.

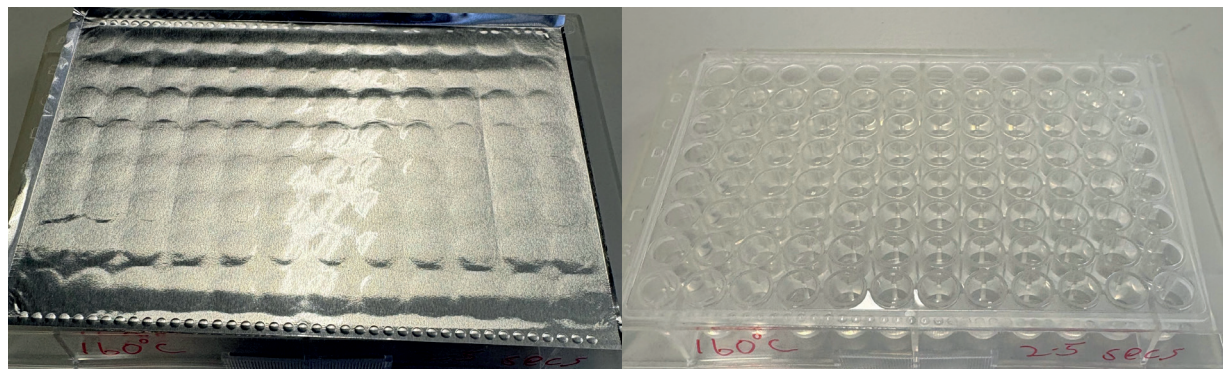


Figure 2: A PLA plate was heat sealed at 160°C/2.5 sec with seal showing good contact (left). The seal was removed (right) and no thermal distortion of the plate was observed.

Heat sealing of polylactic acid (PLA) microPLates for sample storage

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The effectiveness of the plate sealing was then evaluated by filling all wells of the PLA and PS 96-well plates with 200 µl dH₂O using a Certus Flex liquid handling robot. Plates were sealed with the following settings: PLA plates at 160°C / 2.5 seconds and PS plates at 175°C / 2.5 seconds (the recommended setting for PS). The sealed plates were stored at room temperature and weighed on days 3, 6, 10 and 14 (Table 1.) The total mass of dH₂O at the start of the study was 19.2 g.

Table 1: After 14 days, the weight loss of liquid in the PLA plate was 1.81 % of the starting liquid mass and 3.42% in the PS plate.

Manufacturer	Plate Type	Sealing Time/ Temperature	Plate weight loss (mg) - days				Total loss %
			3	6	10	14	
Green Elephant Biotech	PLA	160°C / 2.5 sec	44	93	211	348	1.81
Thermo Scientific	PS	175°C / 2.5 sec	215	351	641	657	3.42

3. Conclusion

Although PLA has a lower melting point than the commonly used PS plastic, this study supports its suitability for storage applications that use heat sealing.

Being a sustainable bioplastic derived from plant starch, the environmental footprint of PLA is approximately 50% lower than that of PS which is an oil-derived plastic. As laboratories and organisations seek to lower their carbon emissions and operate in a more sustainable manner, this data supports the case for swapping from PS to PLA plates in applications that require plate sealing.

Authors & Special thanks

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