

SUSTAINABILITY: CIRCULARITY

FINALIST: HyPStore Consortium

HyPStore is a UK–Australia collaboration that transforms low-value agricultural plastic waste into high-performance graphene nanoplatelets using low-energy Flash Joule Heating (FJH), co-generating hydrogen as a by-product. These graphene nanoplatelets are incorporated into mono-material, linerless, cryogenic hydrogen storage tanks, creating a continuous circular value chain from waste to advanced aerospace-grade applications. Unlike conventional Type III and IV tanks, HyPStore tanks eliminate metallic liners and adhesives, enabling full recyclability, reduced material complexity, and simplified end-of-life recovery.

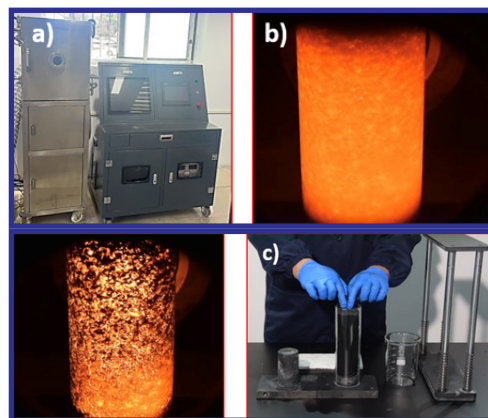
The tanks deliver 30–40% weight savings, improved payload efficiency, and extended service life through embedded self-healing microcapsules. By combining upstream waste valorisation with downstream product longevity, the project closes material loops and provides a replicable model for circular composites.

End-users, including High Altitude Solutions Ltd, benefit from reduced lifecycle emissions, simplified certification, and lower total cost of ownership. Composite manufacturers gain access to modular, recyclable tank architectures, supporting refurbishment, second-life use, and service-based business models. The wider composites sector is encouraged to adopt regenerative material strategies, establishing a benchmark for sustainable design in hydrogen storage, aerospace, automotive, and energy infrastructure applications.

HyPStore has significant market potential: the global hydrogen tank market is projected to exceed £1.36 billion by 2028. Early forecasts suggest capturing up to 4% of the Type-V tank market within five years, equating to £39.6 million in revenue.

The project involved over 4,800 hours of collaborative research across eight UK and Australian partners, combining expertise in graphene production, composite manufacturing, cryogenic performance, self-healing materials, and computational modelling. UK financial investment exceeded £410,000, supported by UKRI–Australia funding, in-kind contributions, and industrial input via Slingsby Advanced Composites for exploitation and scale-up.

Learn more at: www.brunel.ac.uk/research/projects/hypstore-advancing-low-carbon-hydrogen-production-and-safe-storage-for-mobility



The Flash Joule Heating process where a) shows the FJH equipment setup, b) material during and after the heating pulse, and c) Post-FJH collection of Graphene Nanoparticles (image courtesy of HyPStore project partner)