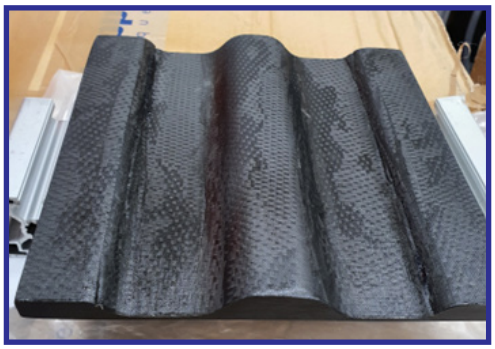
Composites UK Trade Association

BRUNEL COMPOSITES CENTRE

# INNOVATION IN COMPOSITE MATERIALS

## WINNER: HyPStore Project



HyPStore delivers a first-of-its-kind, linerless Type-V composite hydrogen storage tank capable of safely storing liquid hydrogen at -253°C. The innovation centres on a graphene-enhanced carbon/epoxy laminate, incorporating nanoplatelets produced from recycled plastic waste via low-energy Flash Joule Heating (FJH). These nanoplatelets form a tortuous diffusion path that significantly reduces hydrogen permeation, enhancing both gas barrier performance and mechanical durability. By embedding the barrier directly into the composite, HyPStore removes the need for metallic or polymer liners, creating a mono-material structure that simplifies recycling, improves fracture resistance, and enhances cryogenic stability.

The material system has been successfully scaled to near full-size demonstrators using automated robotic filament winding, validating manufacturability and readiness for high-performance applications. End-users across aerospace, advanced mobility, and clean energy sectors benefit from weight savings of 30–40%, increased payload efficiency, reduced system complexity, and improved fuel retention over extended missions. HyPStore's approach addresses a critical industry need: safe, lightweight, and recyclable cryogenic hydrogen storage that overcomes the limitations of conventional multi-material Type III and IV tanks. The circular, scalable design also provides opportunities for broader adoption in marine, rail, and portable energy systems, establishing a benchmark for sustainable composite solutions.

The project is delivered by a UK–Australia consortium: First Graphene Ltd and Australia Sunlight Group lead graphene production; Graphene Innovations Manchester integrates materials into resin systems and demonstrator manufacture; Brunel Composites Centre leads structural design and cryogenic simulation; Queen Mary University London and University of Southern Queensland contribute self-healing and fire-retardant technologies; Slingsby Advanced Composites oversees manufacturing integration; the University of Melbourne supports modelling and process optimisation. Coordinated work packages ensured integration of advanced materials, manufacturing, and sustainability, positioning HyPStore as a scalable, circular, high-performance hydrogen storage solution.

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