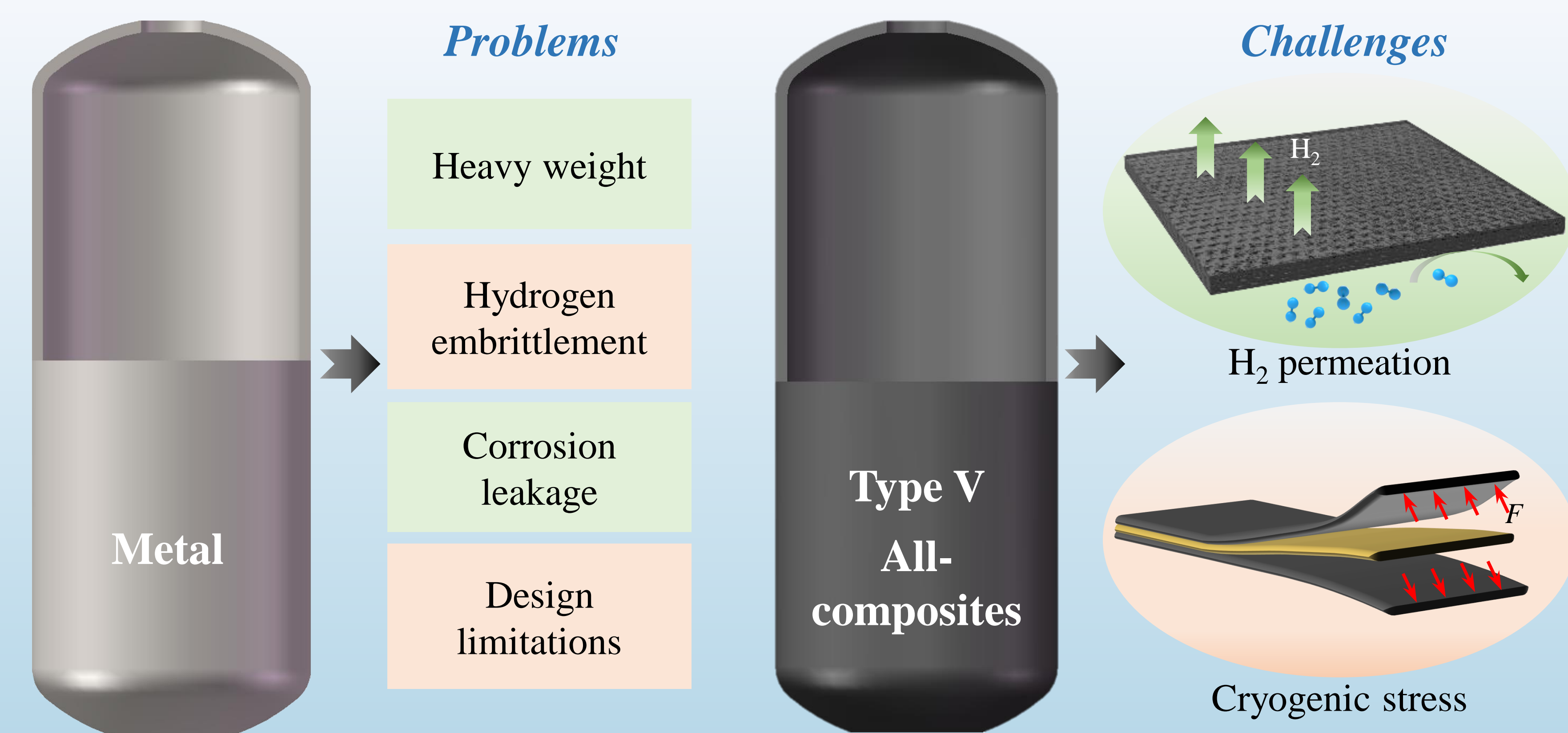


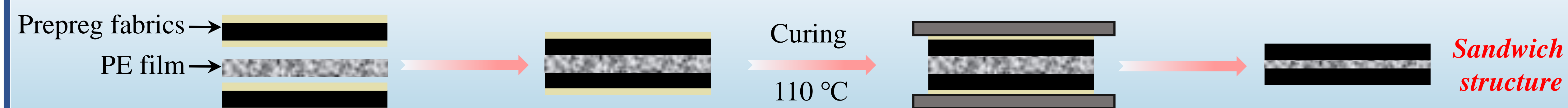
Abstract: Carbon fiber composites for type V LH₂ storage tanks should have both pressure-bearing and hydrogen-barrier properties. In the current work, polyethylene (PE) films were added to the interlayers of carbon fibers for blocking hydrogen permeation. After hot-pressing treatment, the films melted and wrapped the fibers to form a grid structure. The results demonstrated that the grid structure resulted in a 22.7% increase in the cryogenic adhesion force. When 3 layers of PE films were added, the hydrogen permeability coefficients at room and cryogenic temperature were 1.0×10^{-15} mol/(m·s·Pa) and 0.6×10^{-15} mol/(m·s·Pa), respectively, which are lower than the international standard values.

Background

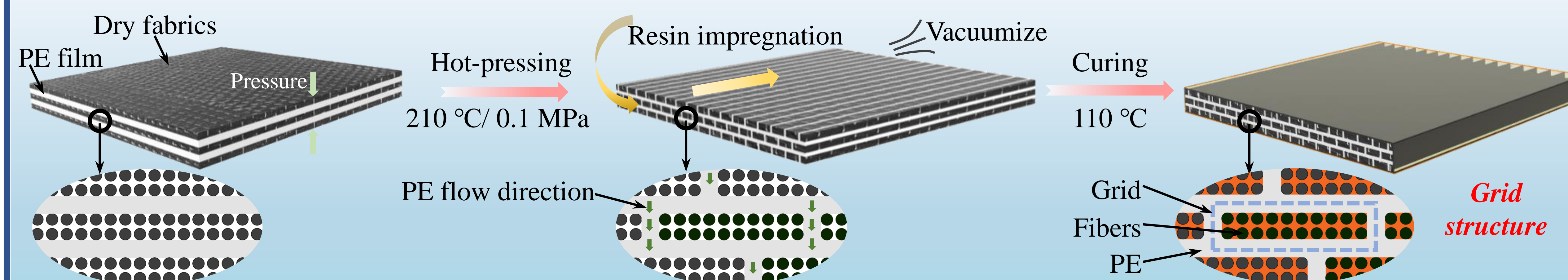


Methodology and Process

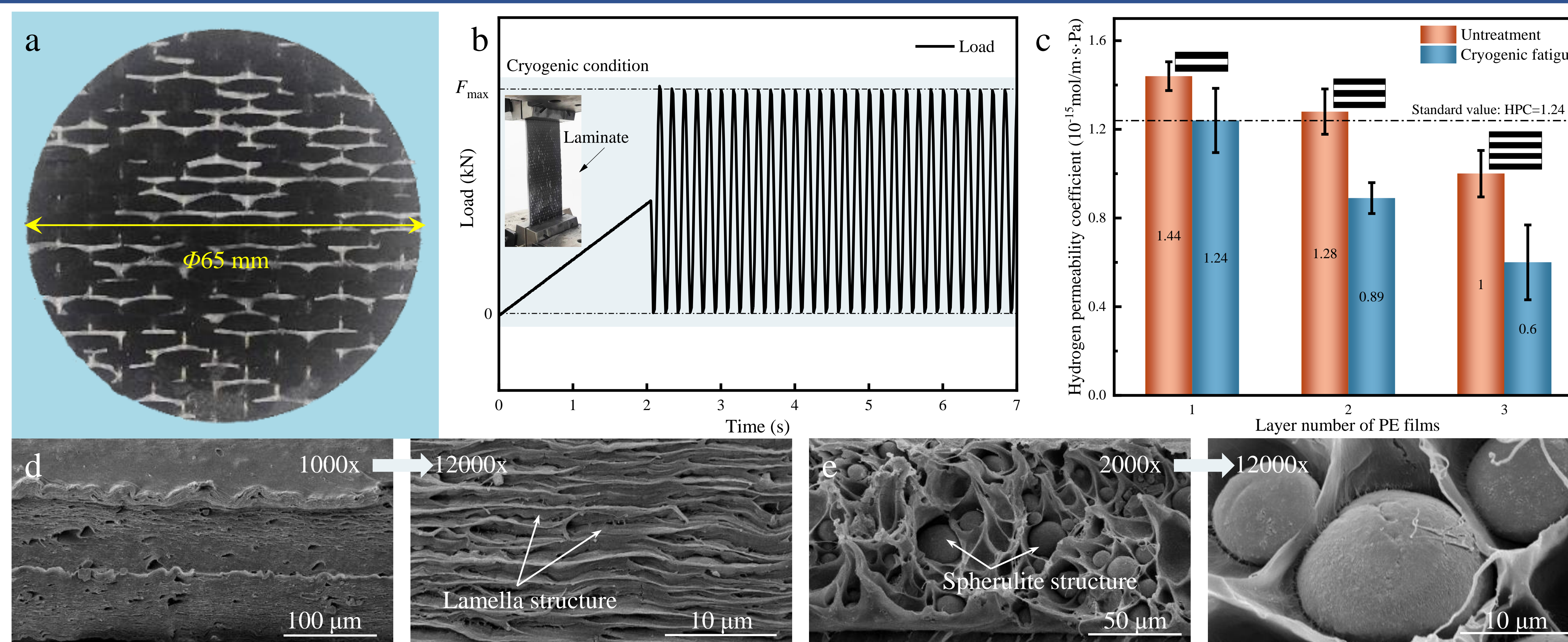
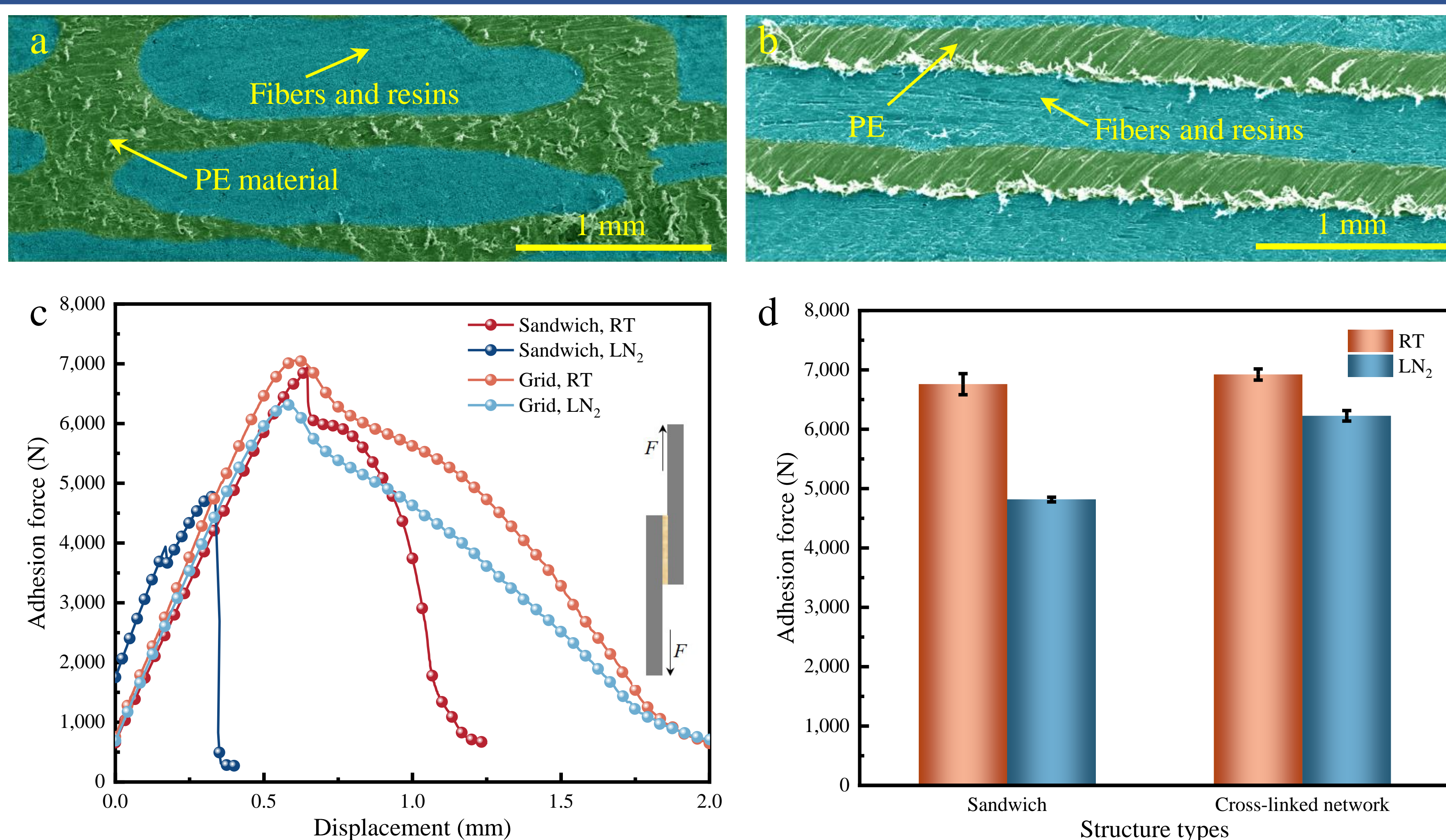
Traditional method



Our method



Results and Discussion



- The cryogenic delamination defects are avoided by forming grid structure.
- Compared to the sandwich structure, the cryogenic adhesion force of the grid structure has increased by 22.7%.

- To meet the usage requirements of LH₂ tanks, at least three layers of gas-barrier film should be added.
- Due to the high toughness of PE, cryogenic cyclic loading will not reduce the gas-barrier property of composites.
- Dense spherulites with irregular distribution generate tortuous paths to inhibit hydrogen permeation.