KYNAR® RILSAN® ELIUM®

Specialty materials for sustainable and competitive hydrogen mobility.

Arkema intends to become the benchmark "materials" partner for hydrogen mobility systems. The underlying technical challenges to be met for the deployment of hydrogen as an energy solution are at the core of Arkema polymers developments: high performance, added value and sustainability.

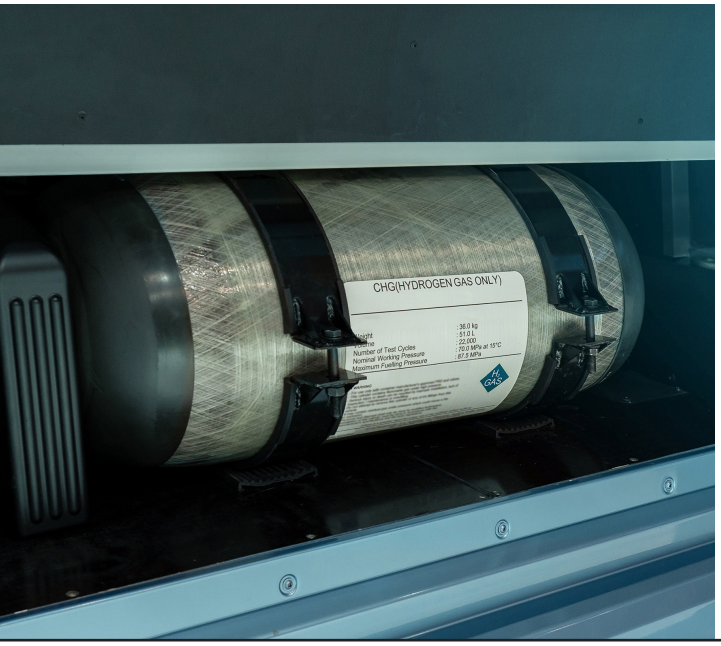
4 axis aiming at developing and pushing to the market disruptive technologies in the field of Hydrogen as a fuel for mobility are contemplated.

Hydrogen tank liners and hoses

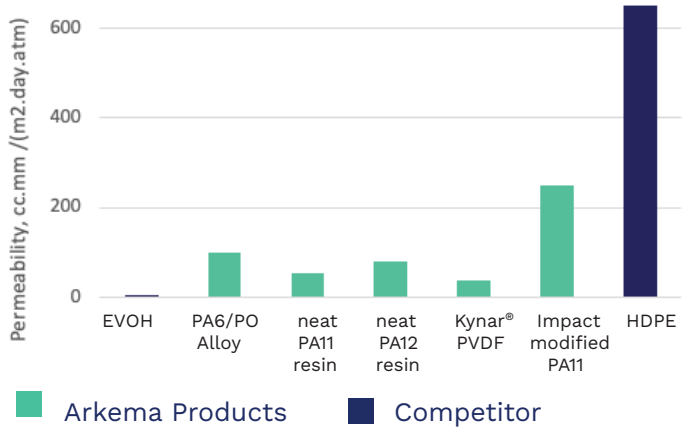
Rilsan® Polyamide 11 is a proven material for type IV hydrogen tank liners and hydrogen hoses. As a highly processable and durable material, PA11 can be used in most hydrogen applications without the need of modifiers. These additives may be critical for processing other materials or enabling them to survive the harsh temperature and pressure cycles involved in these applications. The intrinsic performance of PA11 allows it to be used as a neat or near-neat resin. These additives hinder hydrogen permeation resistance, meaning polyamide 11 can be used in a form which maximizes its barrier performance. Rilsan® PA11 also has great welding properties, requires less drying than short chain polyamides, and can be processed into type IV tank liners via rotomolding, extrusion blow molding, injection molding, and standard extrusion.

Rilsan® PA11:

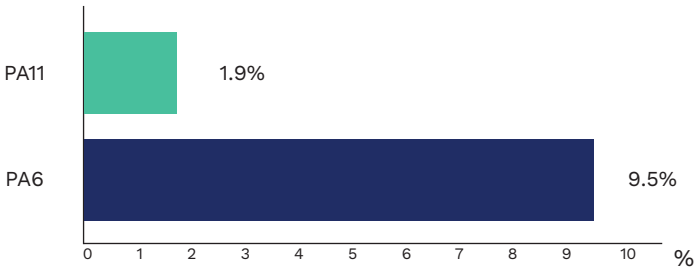
- Excellent hydrogen barrier properties
- Unmatched cold temperature ductility
- Highly Processable + Weldable
- Excellent resistance to blistering
- Biobased + recyclable



H_2 Permeation Performance of Various Polymers



Moisture Uptake at Saturation



ARKEMA

THERMOPLASTIC RESIN COMPOSITES

Fuel Cell Components

Bipolar Plates, MEA, GDL & Seals

Arkema's Kynar® PVDF Is a highly pure, chemically resistant, high temperature polymer that can be considered for use in many applications In a PEM fuel cell.or electrolyzer. Kynar® films are already being used to seal layers within the stack and Arkema is exploring the use of Kynar® PVDF as a binder for composite bipolar plates. Kynar® PVDF can be made into various forms such as non-wovens, coatings and microfiltration membranes for potential use in GDL and MEA membrane substrates.

THERMOPLASTIC COMPOSITE TYPE IV HIGH PRESSURE HYDROGEN TANKS

Elium® UV curable thermoplastic composite and Rilsan® polyamide 11 liners

Main Benefits :

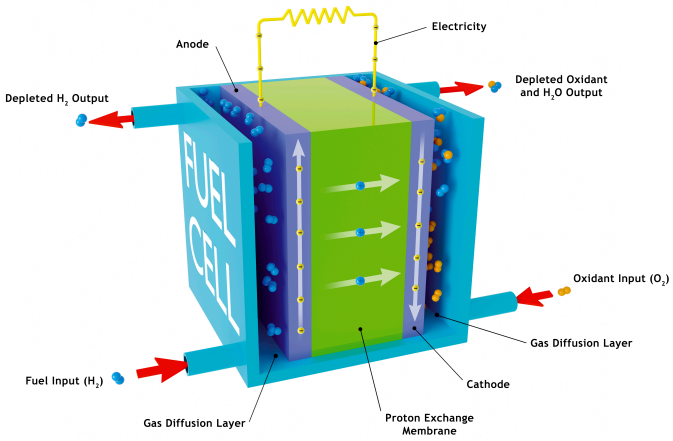
- Performance: weight and material saving thanks to higher ductility and low permeability
- Productivity: suppression of traditional thermoset curing steps and fast photo-polymerisation
- Recyclable: Elium® can be depolymerised allowing circular economy
- Bio-based: Rilsan® PA 11 is synthetized from castor oil

THERMOPLASTIC COMPOSITE TAPES FOR TYPE V EXTREME TEMPERATURES HYDROGEN TANKS

Rilsan®Matrix polyphtalamide thermoplastic composite UDX® tapes

Main Benefits:

- Performance: material performance above 100°C, weight and material savings
- Productivity: suppression of liner production step
- Versatility: other high-performance polymers for cryogenic, electrolyser or conformable tanks
- Recyclability: thermoplastic recyclable composites



Arkema Inc.
900 1st Ave,
King of Prussia, PA 19406,
United States
T +1 610 878 6500

Headquarters: Arkema France
420 rue d'Estienne d'Orves
92705 Colombes Cedex
France
T +33 (0)1 49 00 80 80

arkema.com