White Graphene Reduces Hydrogen permeability

Key findings:

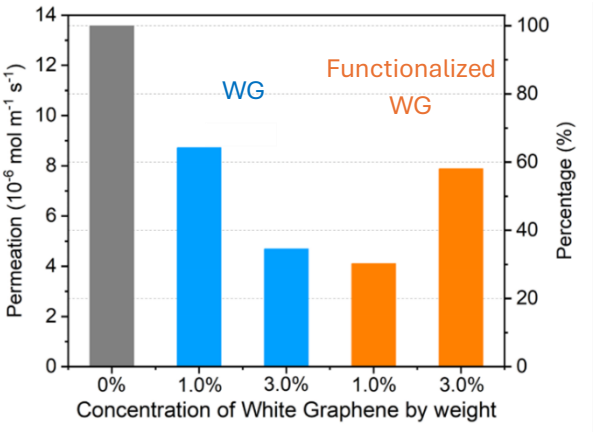
White Graphene (WG) Significantly reduces hydrogen permeability across PA films, thus making it promising for reducing hydrogen embrittlement of steel pipes and high-pressure hydrogen storage vessels.

- Gas permeability: −90%
- Electrochemical permeation: −70%
- 6MPa hydrogen gas electrochemical subsurface hydrogen: −16%

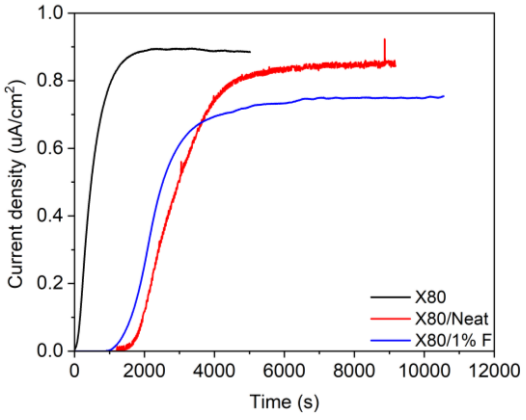
Hydrogen gas permeability of PA11 films

PA11	**Thickness** (μm)	**H_2 permeability of sample 1** (Barrer)	**H_2 permeability of sample 2** (Barrer)	**Average H_2 permeability** (Barrer)	**Permeability** ($E^{-16}mol{\cdot}m^{-1}{\cdot}Pa^{-1}{\cdot}S^{-1}$)
0% F-WG	200	44.99	44.91	44.95	150.58
1% F-WG	198.8	0.36	0.48	0.42	1.41
2% F-WG	191	10.51	10.99	10.75	36.01
3% F-WG	197.6	16.90	16.47	16.68	55.88

Electrochemical hydrogen permeation



Subsurface hydrogen concentration of X80 steel under 6MPa hydrogen gas

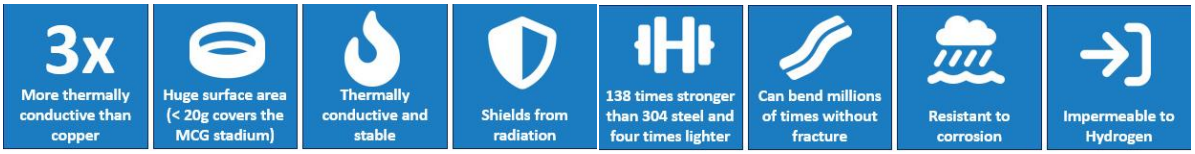


White Graphene

A novel two-dimensional layered nanomaterial - BNNS







PRODUCT CHARACTERISTICS	METHDOLOGY	STANDARD
Appearance	Visual	White solid powder
Lateral Size	Scanning Electron Microscope	0.3-10 µm
Lateral Aspect ratio	Scanning Electron Microscope	1:1 - 1:30
Thickness	Atomic Force Microscope	1-50 nm
Bulk density	EN17199-1 weighting method	0.055 g/cm³
Respirable dustiness fraction	EN17199 Small Rotating drum (M4)	55 mg/kg
Water solubility	OECD 105 Flask Method	Insoluble
Chemical composition and Impurities	Raman Spectroscopy	BN vibrational peak
	Fourier-transform infrared spectroscopy	BN vibrational peaks
	Energy-Dispersive X-ray Spectroscopy	B & N > 98% O < 2% Other < 0.5%
Surface functionalization	-	Customized

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