

Edge Sealing Tape with Getter for PV Modules: Very Long Breakthrough Time and Mechanical Properties at High Temperature

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Background

Moisture induces different degradation mechanisms in PV modules; especially Thin Film ones are susceptible to the impact of moisture. Utilization of an edge sealant is a widely adopted solution to guarantee long operational lifetime, improving reliability and enhancing the stability of device performances.

An ideal edge sealant should be a very good barrier to moisture, excellent electrical insulator and resistant to prolonged UV exposure. Mechanical stability is also of paramount importance in the range of temperature characteristics seen by PV modules in real field operation.

B-Dry Edge Sealant Tape

Thickness: 0.5 - 1.3 mm
Width: 7, 10, 12 mm.

B-Dry is compatible with most common PV module encapsulation processes and materials (EVA, PVB, TPO)
Process temperature range: 140°C to 170°C.

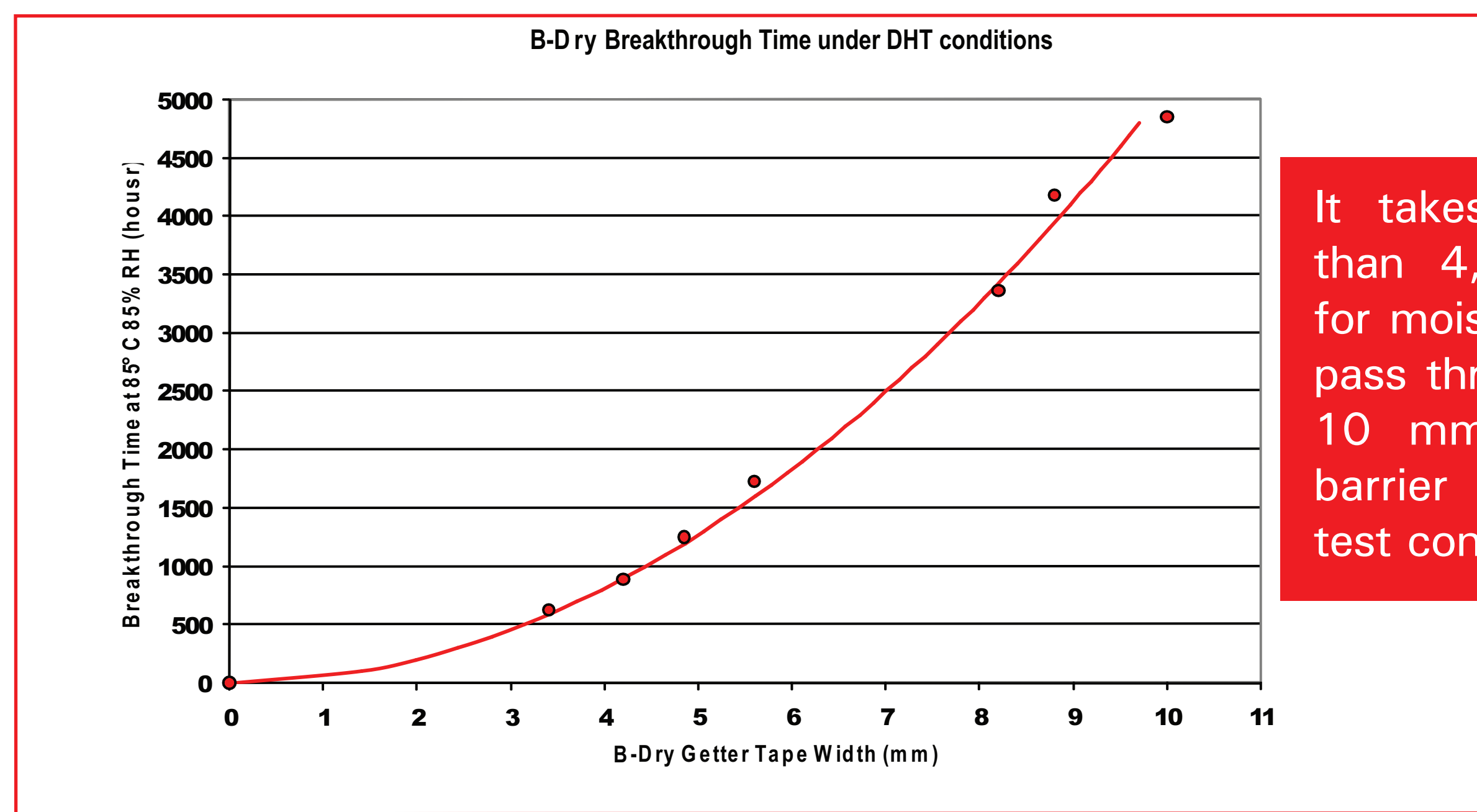


Proposed Edge Sealant Solution

B-Dry[®] Tape is a new concept of edge sealant combining a low permeability thermoplastic polymer and efficient moisture sorbing materials based on SAES Getters proprietary technology. B-Dry works as an **active barrier** against moisture ingress. Value of WVTR is null until the saturation of the moisture sorbing species, which happens after thousands of hours of Damp Heat Test at 85°C and 85% RH (breakthrough time is dependent on tape width).

Features and Results

Moisture Breakthrough time @ 85°C & 85% RH



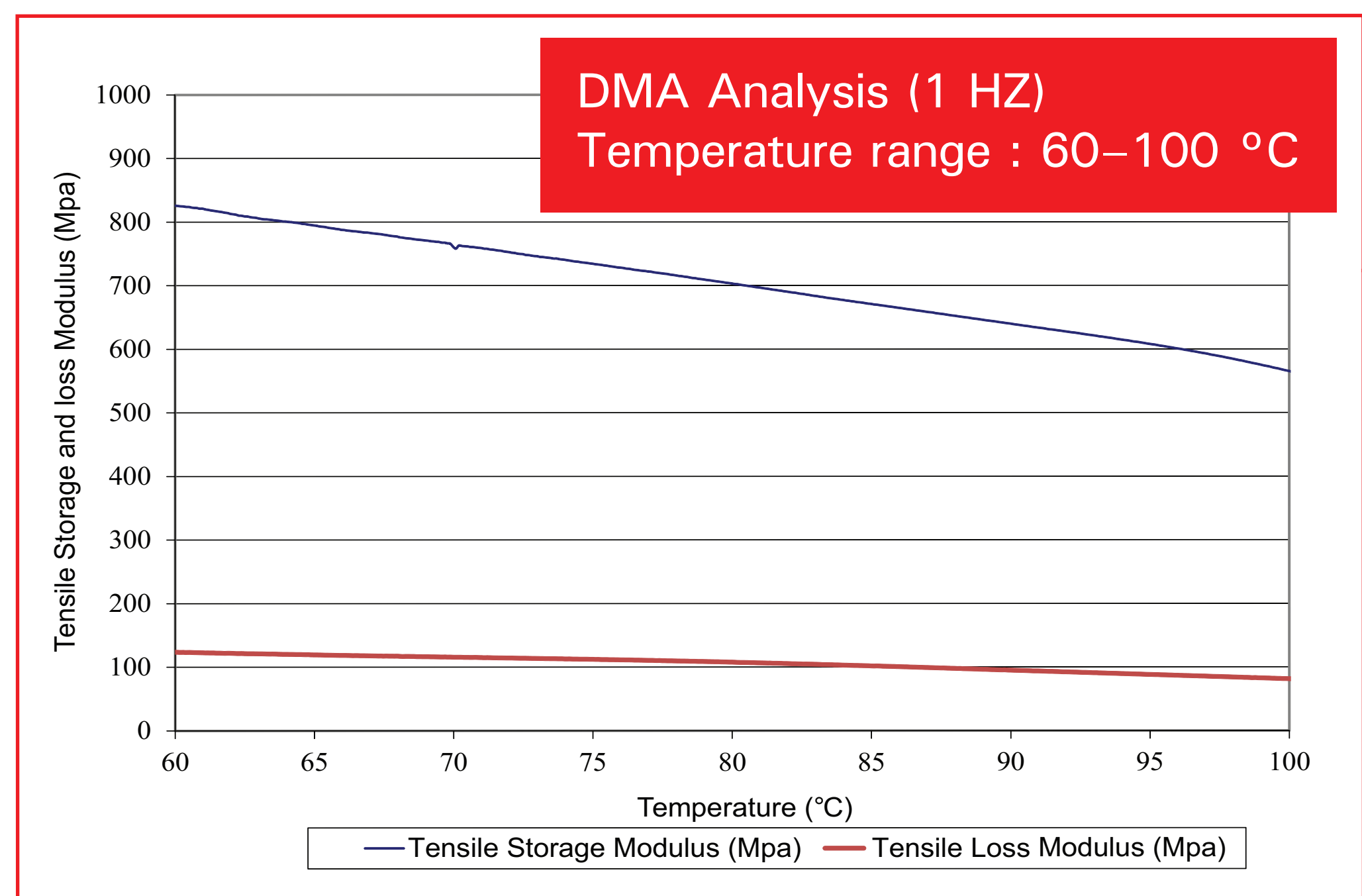
It takes more than 4,500 h for moisture to pass through a 10 mm wide barrier in DH test conditions

Adhesion Characteristics after Aging

Adhesion Strength to Glass (Mpa)			REFERENCE NORM
Lap Shear Test	As received	0.44 ± 0.10	
	After DH test 1000 hours @85°C 85% RH	0.41 ± 0.06	IEC 61646
	After DH test 2000 hours @85°C 85% RH	0.54 ± 0.09	IEC 61646
	After 200 cycles @ -40°C to + 85°C	0.29 ± 0.03	IEC 61646
	After UV aging	0.40 ± 0.03	Xenotest Miami (30 days)

Mechanical Properties

Tensile storage and Loss modules for B-Dry



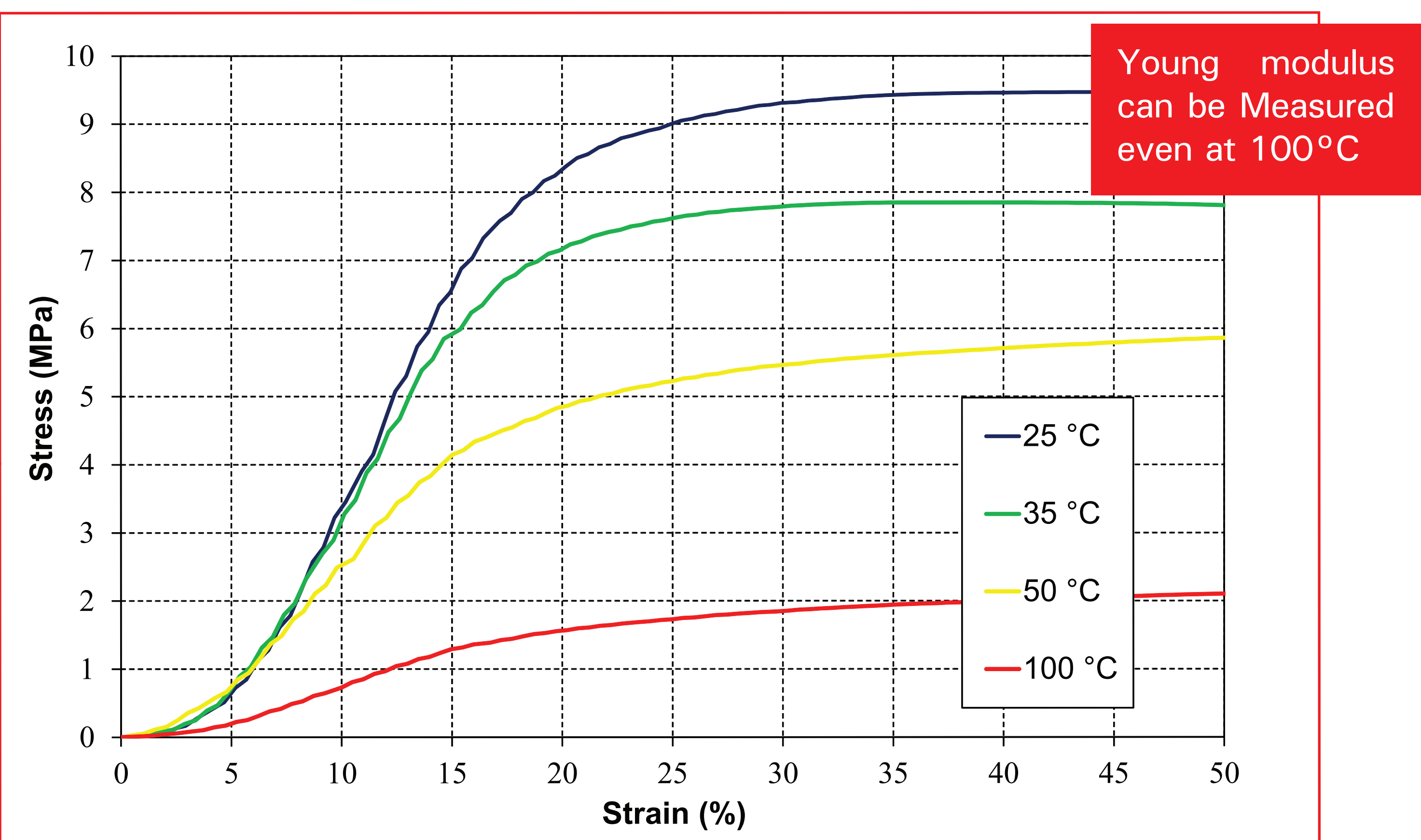
UL listing tests
* Dielectric Strength: 35 kV/mm
* Volume Resistivity: 10¹⁸ Ohm*cm

Before DHT 1000 hours	After DHT 1000 hours
B-Dry: 0.20 µA	B-Dry: 0.25 µA
No B-Dry: 0.20 µA	No B-Dry: 0.99 µA

Wet leakage current of 30 cm x 30 cm CIGS modules encapsulated with PVB before and after 1000 h of damp heat. Measured at ZSW (Stuttgart, D)

Electrical Isolation Characteristics

Stress-Strain Curves for B-Dry at different Temperatures



Young modulus can be Measured even at 100°C

Predicted peak operating cell Temperature for PV modules (Roof Mounting):

- over 100°C in Death Valley (CA), Riyadh, Phoenix (AZ)
- between 79°C and 89°C in Munich (D) and New York (NY)⁽¹⁾

(1) D.C. Miller et al., Creep in photovoltaic modules: examining the stability of polymeric materials components, NREL/CP-5200-47718, February 2011

Conclusions

B-Dry ensures:

- Very high moisture barrier property
- Very good damp heat stability
- High electrical isolation
- UV stability
- Good mechanical stability at temperatures between 60°C and 100°C

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