

TECHNICAL WHITE PAPER

Breakthrough HYPOL™ JM 5013/ HYPOL™ JB 1009 for Comfort Applications

Product Overview

HYPOL™ JM 5013/JB 1009 is a two-component, water-based, catalyst-free polyurethane (PU) chemistry for consumer comfort products. The new HYPOL™ system combines the mechanical performance of conventional hydrophobic PU with the heat/moisture management of conventional hydrophilic PU in one solution without need for ancillary conductive, PCM or gel materials.

HYPOL™ JM 5013/JB 1009 based product performance feature – consumer benefit relationships

PRODUCT FEATURES	CONSUMER BENEFITS
High heat transfer	Cool touch/thermoregulation (comfort)
Moisture management	Thermoregulation (comfort)
Tunable porosity	Breathability (comfort)
Lower compression set	Resistance to deformation/quick recovery (durable)
High tear/tensile strength	Resistance to tearing, shredding (durable)
Catalyst-free/low-VOC	Improved health and safety
Easily encapsulates other functional additives	Added functional benefits: anti-microbial, no odor, stain resistance

PHASE A

HYPOL™ JM 5013
Ratio : 100



PHASE B

HYPOL™ JB 1009
Ratio : 50-1,000
Polyol, monol, water,
cross-linkers, additives

- 2K System
- Low-pressure machine
- 25-40°C
- No catalyst

REACTION

- Low exotherm
- Adjustable reactivity
- No undesired side products

MOISTURE CONTROL PRODUCTS

FOAM

Bedding, furniture and footwear

ELASTOMER

Cosmetic make-up applicators

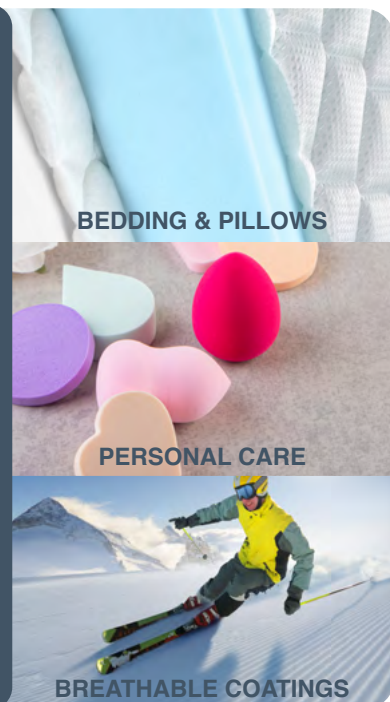
COATING

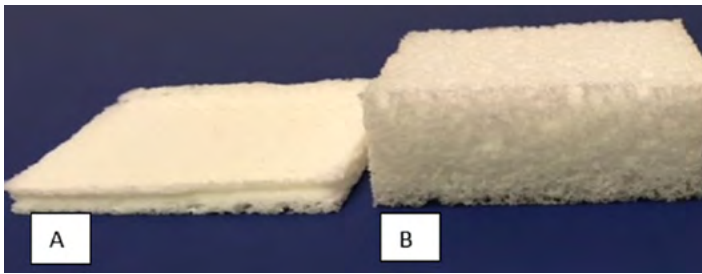
Apparel breathable membranes

BEDDING & PILLOWS

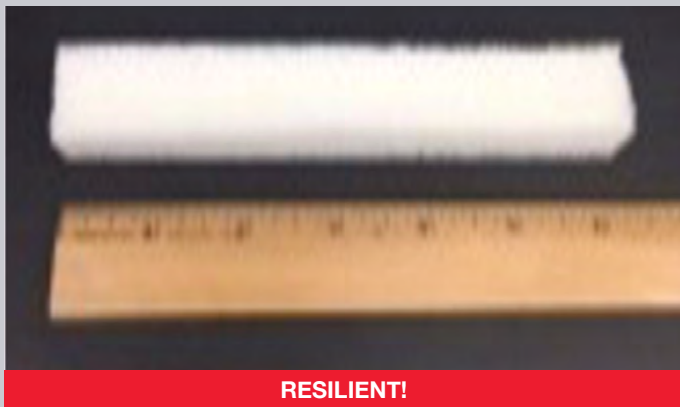
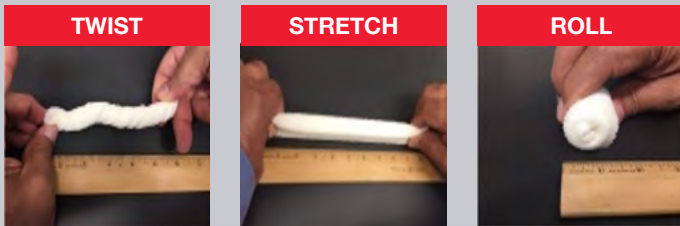
PERSONAL CARE

BREATHABLE COATINGS

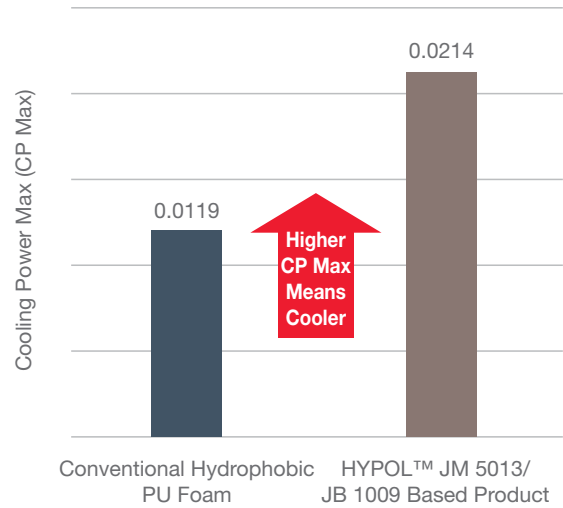




Conventional hydrophilic PU (A) deforms under compression; HYPOL™ foams (B) are resilient to compression and other deformations.

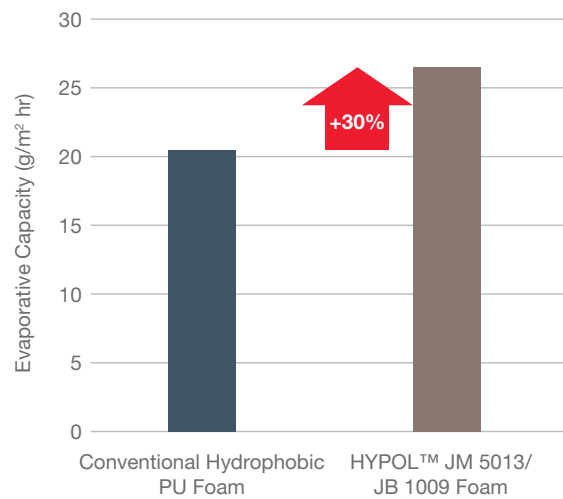


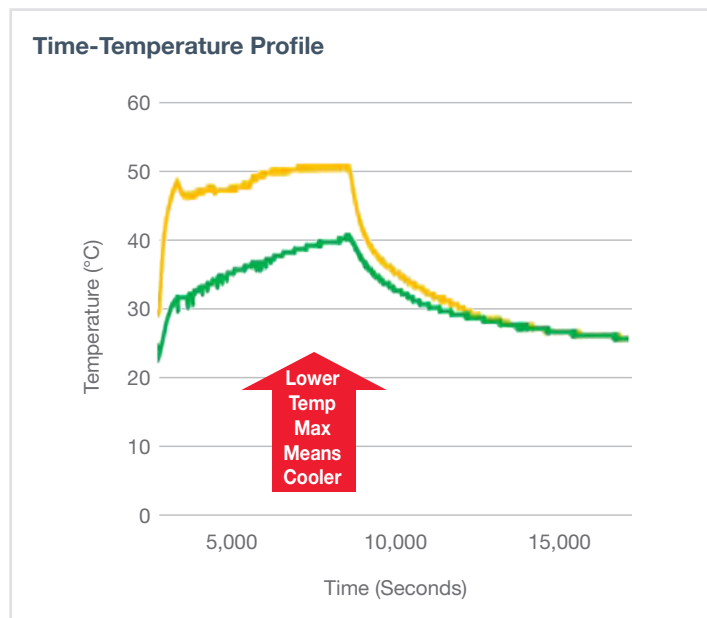
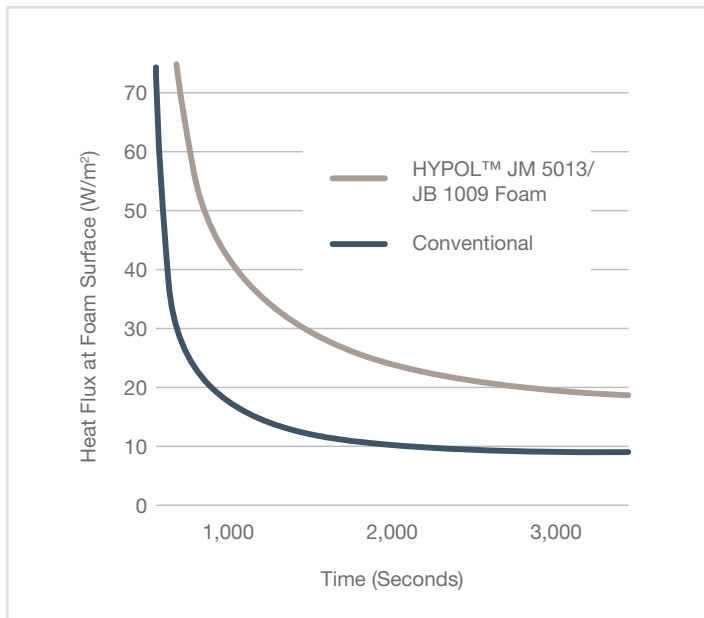
CP @ 1.5W, $W\sqrt{s/K \cdot cm^2}$



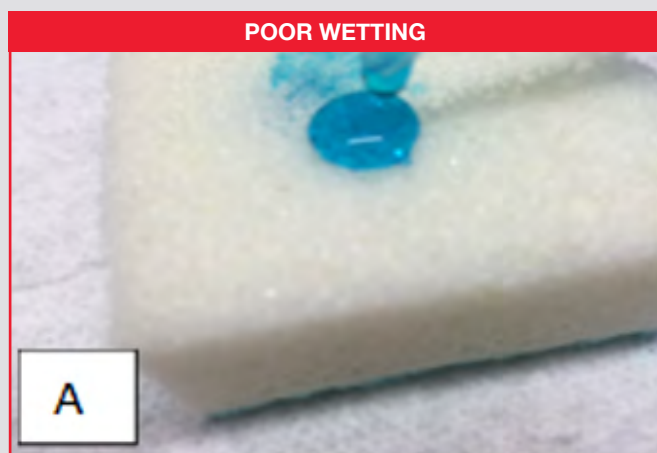
(Above) HYPOL™ based product has ~2X times cooling power and (below) ~30% higher evaporative capacity than conventional PU-based product. (Hydrophilic foams not in application due to poor mechanical properties.)

Coolness from Moisture Transport





(Left) Transient heat conduction (heat flux) HYPOL™ based product is consistently higher and (right) leading to consistently lower surface temperature than conventional hydrophobic PU foam.



HYPOL™ based foam (B) wicks liquid in three seconds compared to 12 seconds for conventional hydrophobic PU foam product (A).

HYPOL™ JM 5013/HYPOL™ JB 1009 excels when compared to benchmark conventional hydrophobic PU foam and conventional hydrophilic foam.

Property	HYPOL™ JM 5013/ HYPOL™ JB 1009 PU	Conventional Hydrophilic PU Foam	Conventional Hydrophobic PU Foam
Medium (Phase B)	Aqueous-based	Aqueous-based	Polyol-based
Catalyst	No	No	Yes
Volatile Content	Low	Low	High
Odor	No	No	Yes
Durability	High	Low	Medium
Density (lb/ft³)	~3.0-6.0	~3.0-6.0	~3.0-6.0
Tear Strength (lbf/inch)	3.0-6.0	< 2.0	≤2.0
Compression Set @ 90% (shape retention/load bearing)	≤10	~87	≤10
Indentation Force Deflection (IFD) 25% (Firmness)	~9.0-11.0	~4.0-6.0	~9.0-14.0
Cooling Intensity on Foam Topper (CP max of sample/benchmark)	~0.0185	~0.0185	~0.0115
Thermal Conductivity (Btu*in/ h*ft²*°F) @ 0% compression	~0.31	~0.32	~0.24
Thermal Conductivity (Btu*in/ h*ft²*°F) @ 50% compression	~0.43	~0.43	~0.28
Moisture Wicking Time (seconds)	~3	~2	~12
Airflow (ft³/min)	~1.0-6.0	~1.0-6.0	~1.0-6.0 (w/o PCM, gels)
Processing (safe & sustainable product)	Eliminates the need of catalyst for processing	Eliminates the need of catalyst for processing	Catalyst poses handling & VOC issues
Tunable properties through Phase A : Phase B ratio	Easy	Easy	Difficult
Ability to make foams, elastomers, coatings	Easy	Easy	Difficult

High Performance
 Medium Performance
 Poor Performance



A

A: HYPOL™ JM 5013 prepolymer liquid (Phase A) is supplied to OEMs packaged in black phenolic lined 55-gallon drums.



B

B: HYPOL™ JM 5013/HYPOL™ JB 1009 based examples of consumer comfort products. The HYPOL™ JM 5013/JB 1009 2K polyurethane chemistry is utilized to make several consumer comfort products – bedding/pillows, cosmetic/personal care products and emerging applications like footwear, exercise mats and prosthetic liners.



C

C: HYPOL™ JB 1009 Aqueous liquid formulation (Phase B) is supplied to OEMs packaged in blue phenolic lined 55-gallon drums.

About Dow

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