

PBI vs Agility and other PBO fabrics

What is PBI and PBO?

While they may sound the same, they are two completely different fibers. PBI and PBO are acronyms for the fiber chemistry each represents:

PBI is the trade name for **Polybenzimidazole**, while **PBO** is the trade name of **Zylon®** or **Polybenzobisoxazole**

What outer shells contain PBI and PBO?

PBI and PBO are used in some of the same applications due to their ability to resist degradation from high heat and flame.

One such application is the outer shell fabric of firefighter turnout gear.

PBI FABRICS:

- PBI Max™
- Kombat Flex™
- PBI Matrix™
- PBI XT™ (known as Gemini XT)

PBO FABRICS:

- Agility™ (20% PBO)
- Advance Ultra® (20% PBO)
- Millenia™ XT (40% PBO)
- Millenia (40% PBO) discontinued

Where are they made?

PBI is a fiber made by PBI Performance Products, Inc. in **Rock Hill, SC.**

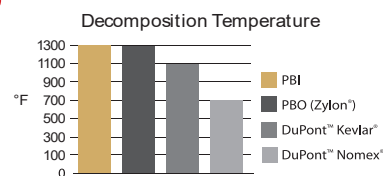


PBO is a fiber made by Toyobo in **Osaka, Japan.**

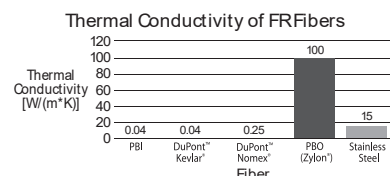


How do they compare in terms of protection?

FLAME PROTECTION – the ability of a fiber to protect against flame is its resistance to melting, shrinking, and charring. The Decomposition Temperature is the temperature at which the fiber begins to break down. Fibers with higher decomposition temperatures create fabrics with better break open resistance to heat and flame. These higher Decomposition Temperatures help PBI and Zylon® provide superior break open protection.



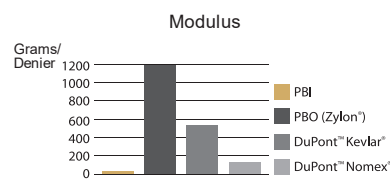
THERMAL CONDUCTIVITY – fibers that are highly conductive will increase the rate at which heat is transferred into the gear to the wearer. The chart illustrates the thermal conductivity for various fibers including stainless steel, as a point of reference. PBO® transfers heat through the fiber faster than stainless steel – which is the main reason why PBO fabrics haven't seen traction in the fire service.



How do they compare in terms of comfort?

Comfort and flexibility are critical for an outer shell. When fighting fires, the wearer should have the least amount of stress caused by the gear since stress is one of the top causes of line-of-duty deaths. The comfort of a fabric can be related to the modulus and moisture regain of the fiber.

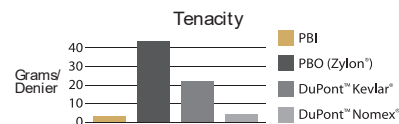
MODULUS – is the fiber's resistance to bending. Higher modulus fibers translates into a less flexible fabric. High modulus means a stiff material.



How do they compare in terms of durability?

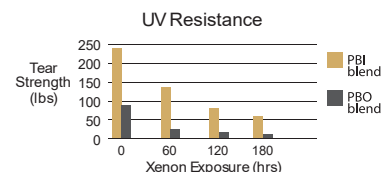
Durability of the outer shell is usually measured via tear resistance and abrasion. The tenacity of the fiber characterizes strength. Note that the durability of the fabric can be affected by UV light. UV light affects the performance of para-aramids and PBO fibers.

TENACITY – The higher the tenacity, the stronger the fiber. Since PBI is not a strong fiber, it's blended with para-aramids, i.e. Twaron® and DuPont™ Kevlar® to provide strength in the fabric.



An independent study has concluded that PBO's tensile properties decreased more rapidly than those of p-aramid fibers, when exposed to UV.*

TEAR RESISTANCE – the industry test commonly used is the trapazoidal tear which measures the pounds of force required to propagate a 1/3 in. tear in a fabric.



PBO Blend – 7.5 oz. 40% PBO /60% Technora®
PBI Blend – 7.0 oz. 35 % PBI / 65% DuPont™ Kevlar® w/ DuPont™ Kevlar® Filament

*Liu, X. and W. Yu. 2006. Degradation of PBO Fiber by Heat and Light. RJTA 10(1):26-32.


About the TOYOBO lawsuit...

TOYOBO, the sole manufacturer of PBO (Zylon) fiber paid **\$66 Million** for Alleged False Claims Related to Defective Bullet Proof Vests.

“Toyobo knew that Zylon degraded quickly in normal heat and humidity, and that this degradation rendered bullet proof vests containing Zylon unfit for use but did not disclose that information. Toyobo published misleading degradation data that understated the degradation problem”

“Selling material for these vests that one knows to be defective is dishonest, and risks the lives of the men and women who serve to protect us.”

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FOR IMMEDIATE RELEASE Thursday, March 15, 2018

Japanese Fiber Manufacturer to Pay \$66 Million for Alleged False Claims Related to Defective Bullet Proof Vests

Toyobo Co. Ltd. of Japan and its American subsidiary, Toyobo U.S.A. Inc., f/k/a Toyobo America Inc. (collectively, Toyobo), have agreed to pay \$66 million to resolve claims under the False Claims Act that they sold defective Zylon fiber used in bullet proof vests that the United States purchased for federal, state, local, and tribal law enforcement agencies, the Justice Department announced today.

The settlement resolves allegations that between at least 2001 and 2005, Toyobo, the sole manufacturer of Zylon fiber, knew that Zylon degraded quickly in normal heat and humidity, and that this degradation rendered bullet proof vests containing Zylon unfit for use. The United States further alleged that Toyobo nonetheless actively marketed Zylon fiber for bullet proof vests, published misleading degradation data that understated the degradation problem, and when Second Chance Body Armor recalled some of its Zylon-containing vests in late 2003, started a public relations campaign designed to influence other body armor manufacturers to keep selling Zylon-containing vests. According to the United States, Toyobo's actions delayed by several years the government's efforts to determine the true extent of Zylon degradation. Finally, in August 2005, the National Institute of Justice (NIJ) completed a study of Zylon-containing vests and found that more than 50 percent of used vests could not stop bullets that they had been certified to stop. Thereafter, the NIJ decertified all Zylon-containing vests.

“Bulletproof vests are sometimes what stands between a police officer and death,” said Attorney General Jeff Sessions. “Selling material for these vests that one knows to be defective is dishonest, and risks the lives of the men and women who serve to protect us. The Department of Justice is committed to the protection of our law enforcement officers, and today's resolution sends another clear message that we will not tolerate those who put our first responders in harm's way.”

“This settlement sends a strong message to suppliers of products to the federal government that they must be truthful in their claims, particularly with regard to health and safety,” said Carol Fortine Ochoa, Inspector General of the General Services Administration.

This settlement is part of a larger investigation undertaken by the Civil Division of the body armor industry's use of Zylon in body armor. The Civil Division previously recovered more than \$66 million from 16 entities involved in the manufacture, distribution or sale of Zylon vests, including body armor manufacturers, weavers, international trading companies, and five individuals. The settlement announced today brings the Division's overall recoveries to over \$132 million. The United States still has lawsuits pending against Richard Davis, the former chief executive of Second Chance, and Honeywell International Inc.

The settlement announced today resolves allegations filed in two lawsuits, one brought by the United States and the other filed by Aaron Westrick, Ph.D., a law enforcement officer formerly employed by Second Chance who is now a Criminal Justice professor at Lake Superior University. Dr. Westrick's lawsuit was filed under the qui tam, or whistleblower, provisions of the False Claims Act, which permit private individuals to sue on behalf of the government for false claims and to share in any recovery. The Act also allows the government to intervene and take over the action, as it did in 2005 in Dr. Westrick's case. Dr. Westrick will receive \$5,775,000.

This case was handled by the Justice Department's Civil Division, along with the General Services Administration, Office of the Inspector General; the Department of Commerce, Office of Inspector General; the Defense Criminal Investigative Service; the U.S. Army Criminal Investigative Command; the Department of the Treasury, Office of Inspector General for Tax Administration; the Air Force Office of Special Investigations; the Department of Energy, Office of the Inspector General; and the Defense Contracting Audit Agency.

The claims settled by this agreement are allegations only; there has been no determination of liability. The lawsuits resolved by the settlement are captioned United States ex rel. Westrick v. Second Chance Body Armor, et al., No. 04-0280 (PLF) (D.D.C.) and United States v. Toyobo Co. Ltd., et al., No. 07-1144 (PLF) (D.D.C.).

Topic(s):
False Claims Act

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