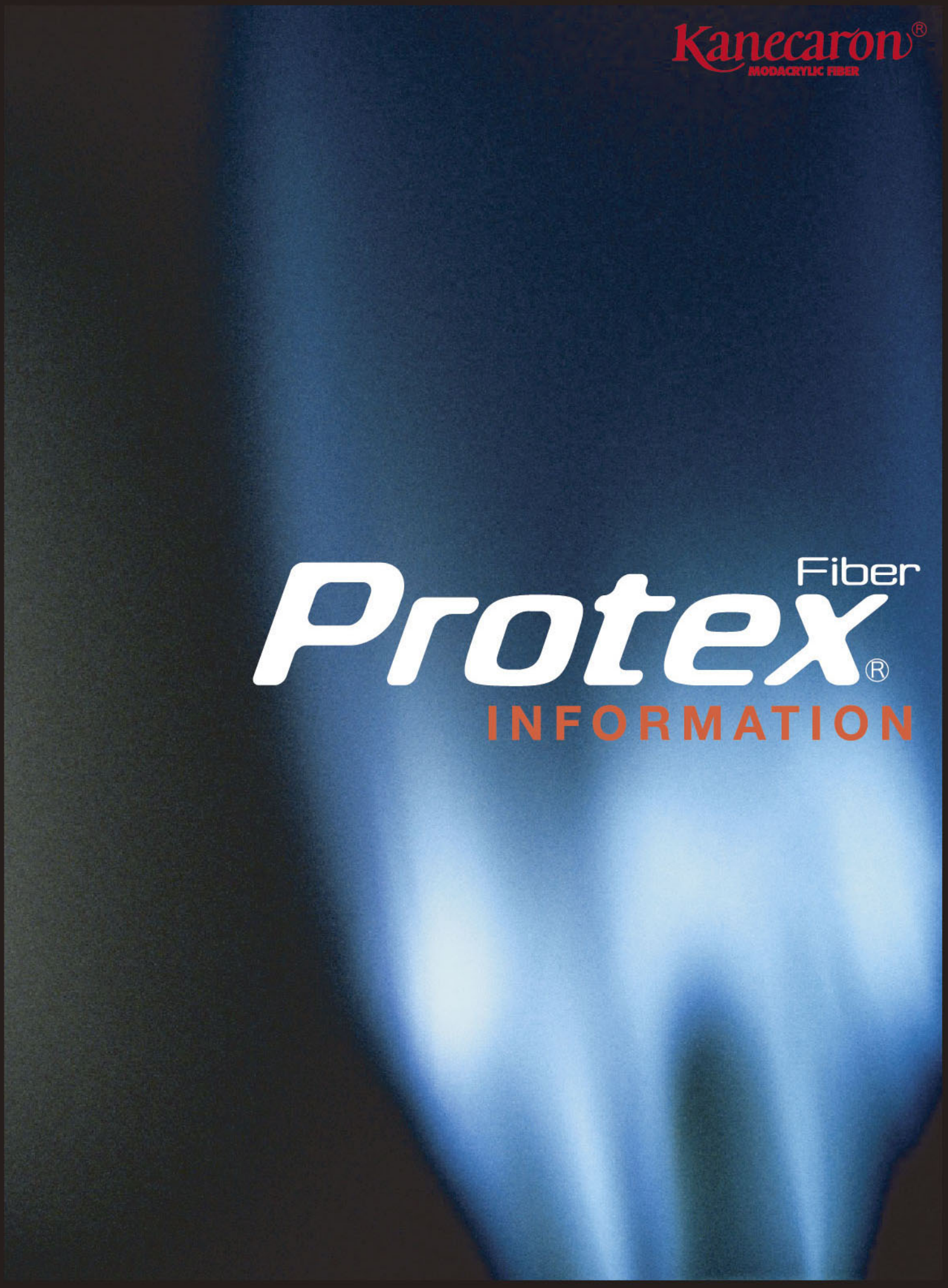
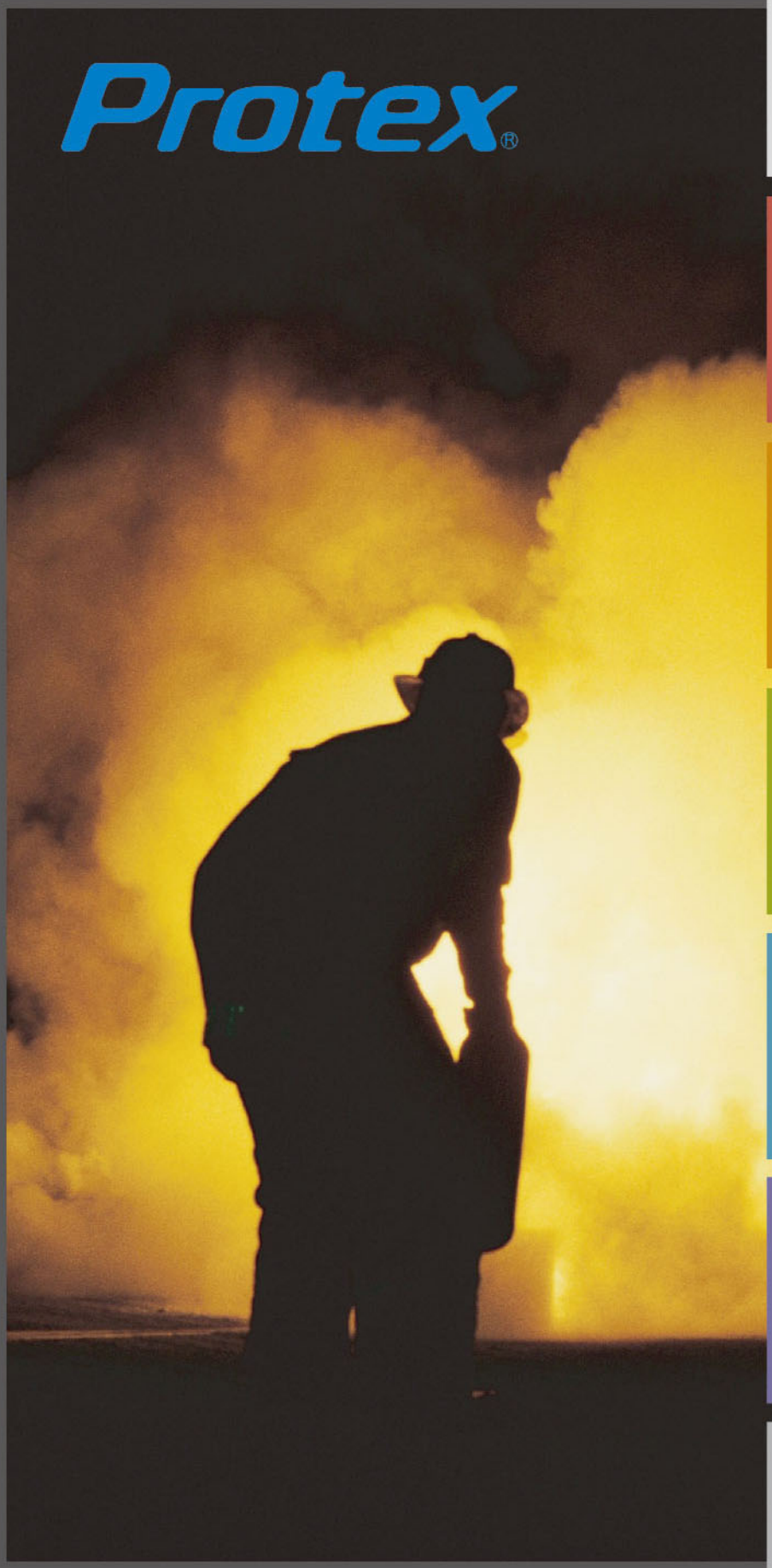
Kanecaron®
MODACRYLIC FIBER

Protex® Fiber

INFORMATION



kaneka



Protex® Fiber

Kanecaron®
MODACRYLIC FIBER

What is Kanecaron/Protex?

Kanecaron/Protex is a modacrylic fiber developed by Kaneka.

Kanecaron®

Kanecaron is a functional fiber that possesses the characteristic of high flame retardancy(FR) as well as acrylic fiber's natural attributes of softness and dyeability. It is an inherently self-extinguishing FR fiber that imparts excellent flame-retardancy to fabrics and synthetic fibers.

Protex®

Protex is the advanced FR fiber in the Kanecaron family.
Its advanced FR and heat resistance, upon blending, improves FR performance in flammable fibers like cotton or polyester.

Modacrylic

The generic name of a fiber that has a lower acrylonitrile (35-85%)level than ordinary acrylic fiber in its make up.

Self extinguish

No flame spread and the ability to stop combustion when the flame source is removed. Kanecaron/Protex will create a char that works to prevent the flame without melting.

Inherent FR fiber

Polymerized FR fiber that does not require topical FR treatments.

Kanecaron Protex

Advantage 1

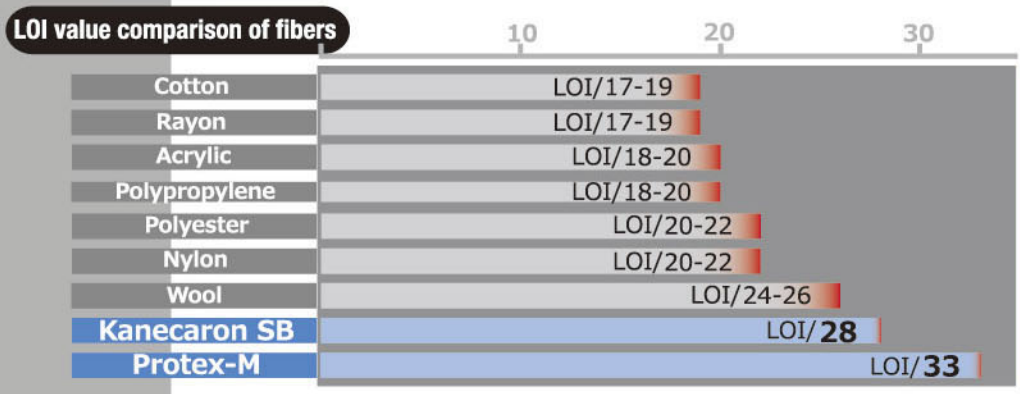
Inherently Flame Retardant

Kanecaron / Protex is an inherently flame retardant product in which the fiber resin itself contains the flame retardant ingredient.
When the flame source is removed Protex has a self-extinguishing nature by which combustion stops immediately. Unlike FR treatments, there is no deterioration in flame retardancy after repeated washing or normal use over time.

Limiting Oxygen Index(LOI)

In conformity with JIS L 1091

Kanecaron/Protex exhibits a high LOI figure in comparison to other fibers.



Limiting Oxygen Index(LOI)

LOI is the minimum required oxygen volume (by percent) that a specimen requires to continue burning in a gas mixture of oxygen and nitrogen.
The higher oxygen value required to make a test specimen burn equates higher FR.

Note: the above are test results conducted by Kaneka Coporation and are not guaranteed.

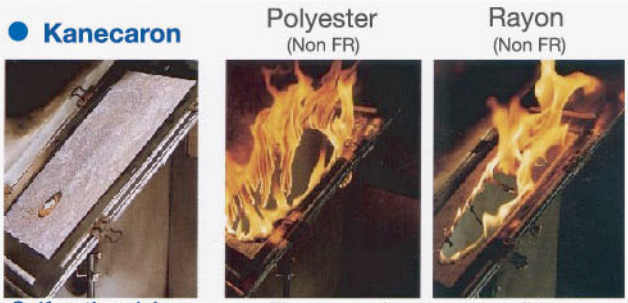
Self-extinguishing

Self-extinguishes when flame source is removed.

In the case of flammable fabric, fire spreads very quickly when ignited.

Kanecaron/Protex blended fabric will self-extinguish and will form a char barrier that works as a shield to minimize fire damage.

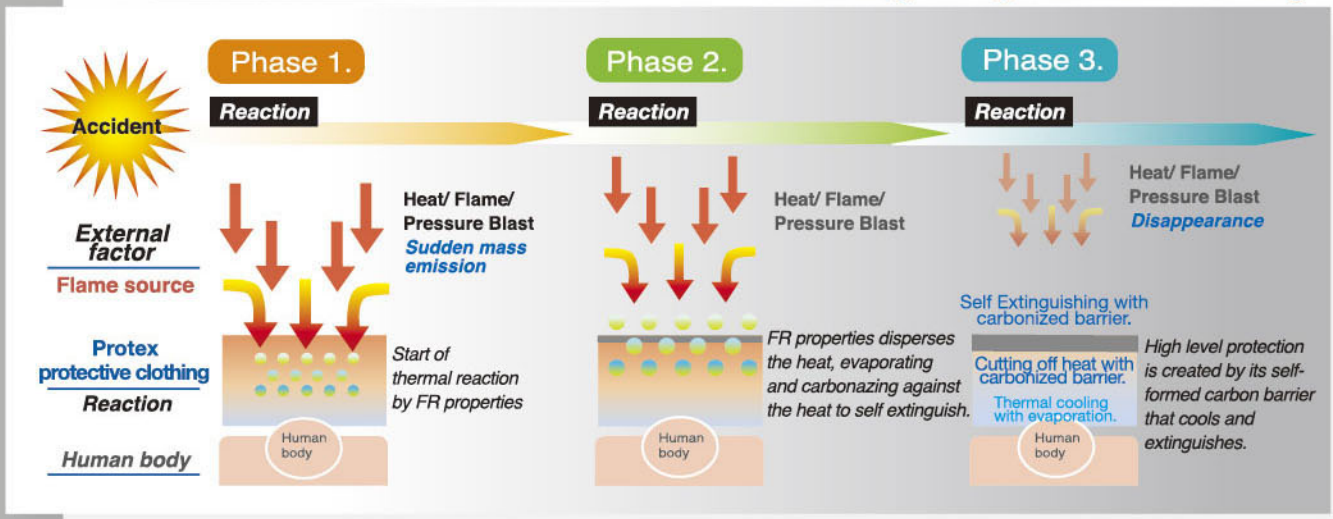
45°micro burner method:
The combustion test due to
JAPAN FIRE RETARDANT ASSOCIATION



The Mechanism of FR

Protex protective clothing in explosion hazard

Protex reacts to flame and high heat radiation instantly, providing protection with its special FR mechanism of self-extinguishing and thermal cooling.



Melt-resistant (Carbonization)

Kanecaron/Protex stops the spread of the fire and extinguishes it with the char barrier it forms when the flame source is removed. Unlike other thermoplastic fibers, such as polyester, Kanecaron/Protex does not melt or form droplets that could stick to skin and cause injury.

No molten droplet Melt/Drip Resistance

When thermoplastic fibers, such as polyester and nylon, melt they produce hazardous high temperature droplets that could cause severe burns to the skin.

Kanecaron/Protex melt-resistance and carbonization attributes not only extinguish the fire, but also play an important role in preventing secondary injuries.

Prevention of dripping

Note: The effectiveness of melt/drip prevention varies depending on the type and ratio of raw cotton used.

Kanecaron/Protex for non-woven fabrics; FR-Melt/Drip Resistance; Combustion Analysis

Plastic material devices for instrument parts; UL 94 Standard

Exam method

The specimen is held perpendicular to the table above the gas burner with the bottom end in contact with the flame. If the fire diminishes in less than 3 seconds the specimen is kept in contact with the flame for additional 10 seconds.

Criterion (Part excerpt)

Result	After Flame	Burning Drip
V-0	≦10sec.	0
V-1	≦30sec.	0
V-2	≦30sec.	Permissible

Protex®/FR-Rayon/Polyester (300g/m²)

FR-Rayon/Polyester (300g/m²)

Result

Sample ①
Protex®/FR-Rayon/Polyester
The non-woven fabric carbonized immediately after the flame source was removed and did not drip.
Conforms to V-0

Sample ②
FR-Rayon/Polyester
The non-woven fabric continued to burn and drip after the flame source was removed.
Non-conforming

Automobile Interiors FMVSS Standard (No.302)

Exam method

The specimen is held perpendicularly in contact with the flame for 15 seconds.
The speed of combustion is observed.

Criterion

non self- extinguishing	combustion-speed (between reticules)	≦ 100mm/min
self- etinguishing	combustion-distance furthermore combustion-time	≦ 50mm ≦ 60sec

Sample❶ Protex®:Polyester 10%:90%

Sample❷ Polyester 100%

Sample❸ FR-Rayon:Polyester 10%:90%

Result

Sample❶
Combustion or melting was not observed in specimens mixed with Kanecaron/Protex.

Summary - Combustion Analysis and FR standards

The use of Kanecaron/Protex allows for creational products to meet various FR standards around the world.

- Please consult us for a specific formula to meet each FR standard.
- For more infomation on many international FR standards Kanecaron/Protex has satisfied, please refer to page 13

Kanecaron
Protex
Advantage 3

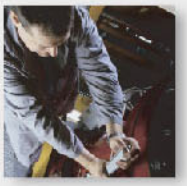
Highly Blendable

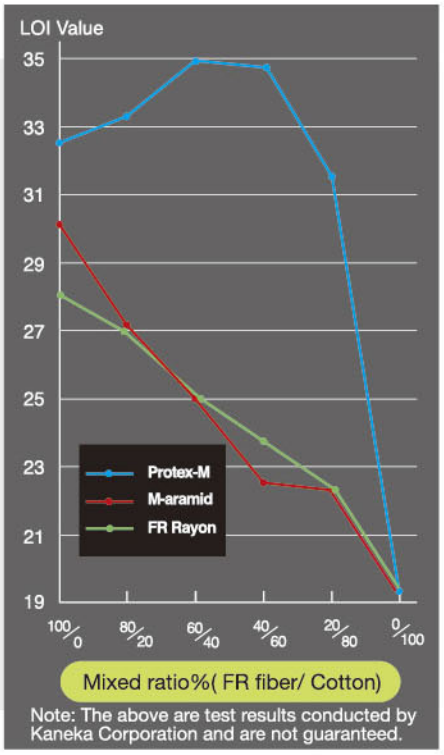
The superior properties of Kanecaron/ Protex allow for blending with flammable fibers in various combinations to achieve a high level of FR performance.

Blendability / Adaptation of cellulosic fiber

Protex-M blended with cellulosic fibers such as cotton and rayon, increases the overall FR performance.

- The graph on the right shows the LOI values of cotton fiber mixed in 3 blends(Protex-M, meta-aramid, FR rayon) at various ratios.
- Protex-M with its outstanding flame retardancy allows for higher blend ratios with cotton. The resulting cellulosic blend fabric is well suited for use in both ordinary and industrial environments.



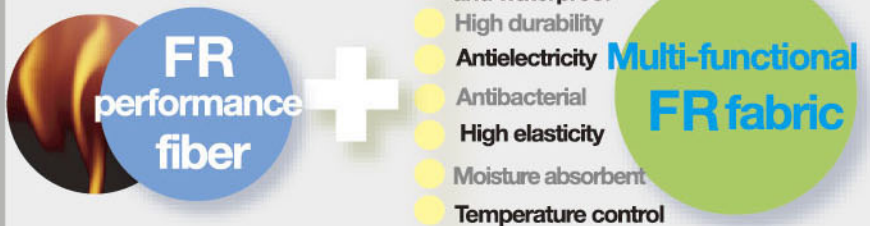
Note: The above are test results conducted by Kaneka Corporation and are not guaranteed.

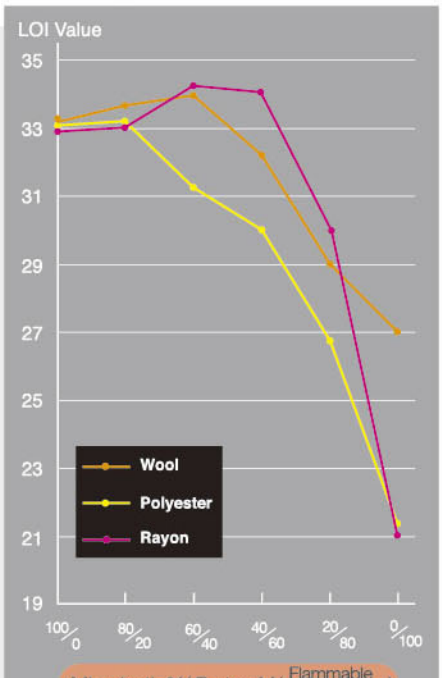
Blendability / Compound functionality

When blended Protex-M has the capacity to add flame retardancy to flammable fibers.

- The graph on the right shows the LOI values of Protex-M fibers, each mixed with one of three flammable fibers: polyester, rayon, wool.

It utilizes the different merits of the Protex fiber, providing a multi-function FR fabric as shown below.





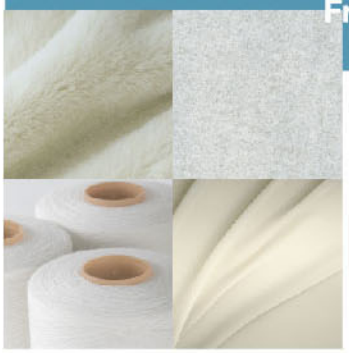
Note: The above are test results conducted by Kaneka Corporation and are not guaranteed.

Easy Processing (Spining, Dyeing, Molding)

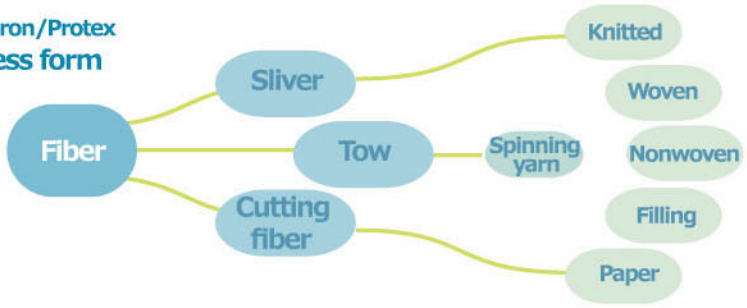
Kanecaron/Protex can be blended with other fibers for intimate blending or in various fabric combinations. Cationic dyeing makes possible expressions of beautiful and long lasting color shades.
In most cases it can be processed under the same conditions as conventional acrylic fiber.

Kanecaron Protex
Advantage 4

From raw material to product ; easy processing Spinning

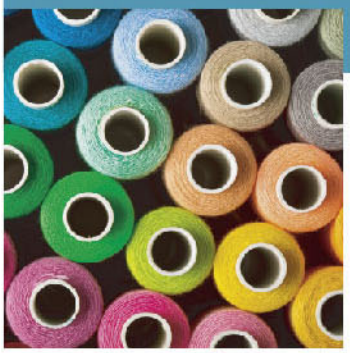


Kanecaron/Protex Process form



Recommendation processing point		
	❶ Temperature and humidity	Room temperture=20-25 deg C / Humidity=50-60% RH
	❷ Opening and Carding	The same condition of cotton, polyester, acrylic can be applied but a more gentle condition is preferred because Kanecaron/Protex fiber is easy to open.
	❸ Drawing, spinning and rewinding	Low tension will be required to have a better yarn quality. Regarding the ring type, a backed ring is the best to use in order to avoid the excessive friction caused by the traveler and tension control.

Beautiful hues with cationic dyeing Dyeing



Beautiful and long lasting colors can be obtained with cationic dyes as with regular acrylic fibers.

With this

- High designability
- High contrast, high visibility color expressions made possible

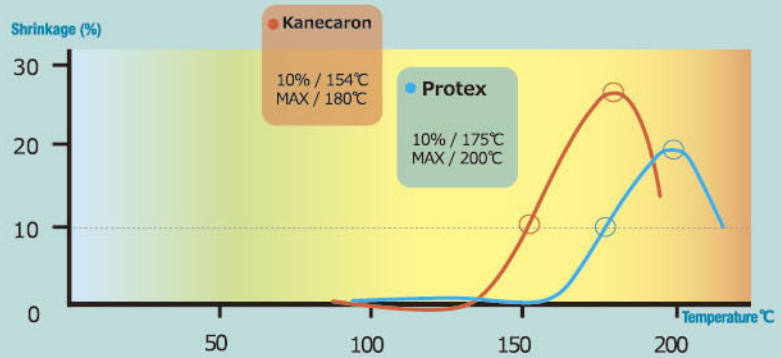
Recommendation processing point		
In case of stock dyeing	❶	The step-wise and low rise control in the temperature is required around 85 deg C due to the start of migration and quick absorption rate.
	❷	Dyeing temperture should be kept below 98 deg C, as the fabric will start to shrink at 100 deg C or higher and the fiber will become stiff. Protex allows for up to 103 deg C as a maximum dyeing temperature.
	❸	The amount of retarder should be reduced to avoid the delay of absorption of dyes.Carriers can be used for the deep shades, but a deoxidization process will be required after dyeing.

Stable molding with short processing time Molding

Kanecaron/Protex is suitable for molding. Its elasticity is at its highest when within the temperture range of 120 to 130 degrees celcius. This allows for molding with a deep draw over 100% depth on the fabric.

Kanecaron/Protex keeps a molded shape without stress unlike other common fabrics such as knit or elastomeric yarn that will revert to the original shape after tension is removed.

Softening curve in thermo forming



Mesurement condition

Mesurement range (Length)	30mm
Loading	5mg/d
Temperature rising speed	3℃/min

Fabrics and non woven made with Kanecaron/Protex can be thermo formed with a common plastic forming facility and under simple temperature management.

It can be thermoformed either by itself or in combination with vinyl chloride, pp, polystyrene forms, polyethylene and other materials, and is often used in interiors of automotives.

Kanecaron
Protex
Advantage 5

Soft and Light

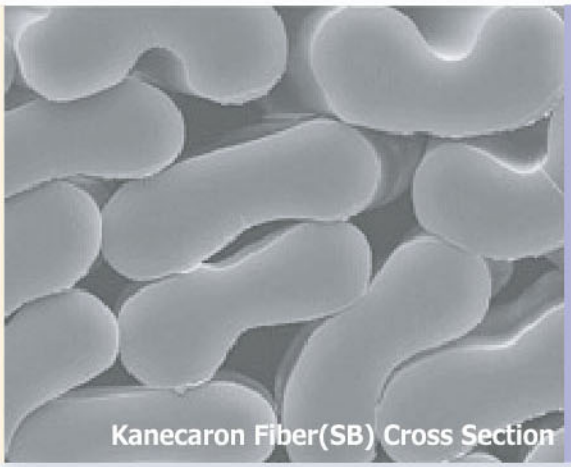
Kanecaron/Protex is light, warm, soft and flexible due to its unique fiber form.

The properties created by its unique fiber form

In addition to being a functional fiber with special properties fit for industrial use, Kanecaron/Protex also possesses unique qualities that make it a perfect fit for a wide range of clothing and interior goods applications.

Such qualities are the result of combining modacrylic's attributes and Kanecaron/Protex's original fiber-form molding.

By combining with cotton and other cellulosic or natural fibers both functionality and comfort can be achieved.

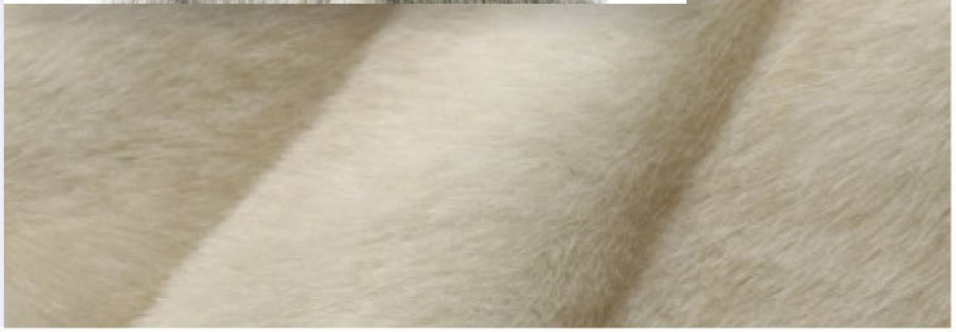


Kanecaron Fiber(SB) Cross Section

Kanecaron / Protex is

- Light
- Warm
- Flexible
- Soft
- Pliant

- Various processing methods can be applied to create different looks and textures. It excels especially in re-creating varieties of fur-like fabrics.



Kanecaron
Protex

Kanecaron・Protex List of fiber types

TYPE	Kanecaron				Protex				
	Standard		FR		High-level FR				Oeko-tex
	SB	SP	S B Y	S Y S	Protex-W	Protex-C	Protex-S	Protex-M	Protex-Q
LOI Value	28	28	30	32	34	34	34	34	34
Luster	Bright	Semi-dull	Semi-dull	Dull	Semi-dull	Dull	Dull	Dull	Dull
Length Dtex × Cut(mm)	1.7×38 1.7×51 2.2×38 2.2×51 3.3×51 3.3×64 5.6×51 5.6×64 11×51 27×51	5.6×102	2.2×38 2.2×51 3.3×51	1.9×38 1.9×51 3.3×51 3.3×89 5.6×51	1.9×38 1.9×51	1.7×38 1.7×51	2.2×51 7.8×64 17×64	2.2×38 2.2×51 3.3×V100	1.7×38 1.7×51
Tenacity (cN/dtex)	2.7	2.7	2.7	2.7	3.2	3.2	3.2	2.5	2.4
Elongation (%)	27	27	27	27	25	25	25	25	22

Note: The data provided is for reference purposes only and is not meant to be a guaranteed value.

TYPE	Kanecaron					
	Dope-dyed Black	Dope-dyed Blue	Dope-dyed Gray	Dope-dyed Camel	High shrinkage	No crimp
	KCDY(10)	KDU180	KCD18	BM	KCEHHB	KCE TOW
LOI Value	30	30	28	28	28	28
Luster	-	-	-	-	Bright	Bright
Length Dtex × Cut(mm)	2.2×51	2.2×51	2.2×51	3.3×64 5.6×64	3.3×102	3.3×TOW
Tenacity (cN/dtex)	2.5	2.5	2.5	2.5	2.3	2.5
Elongation (%)	30	30	30	30	30	30

Note: The data provided is for reference purposes only and is not meant to be a guaranteed value.

Please contact us for the latest information.

Kanecaron Protex

Applications

Clothing

Protective clothing Workwear Hoods
Pinafores Arm covers Filling

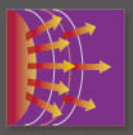
Protective gear is often regulated by strict and specific national or regional law to ensure safety.

Kanecaron/Protex will meet the demands of both daily safety and industrial FR regulations.

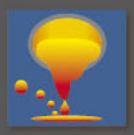
Potential Hazards in Industrial Environment

man-made diasters

Fire, Spark



Radiant heat



Molten metal

Explosion

Chemicals

Electric Arc

Protecting the human body from potential injuries in dangerous industrial environments requires proper use of qualified protective clothing.

Protex as workwear

The material's natural functions

Protective function

High FR,and self-extinguishing ability, as well as resistance against chemicals, do not wear out or wash off over time.

Functionality and comfort

Clothing function

Protex can be mixed with other materials while maintaining its original function. Blending with cotton or cellulosic fibers in particular improves air-permeability and sweat absorbency for addition of comfort.

High quality and durability

Product function

Fabrics and clothing made with Kanecaron /Protex are durable and hold up to heavy and continuous use over time.

Protex can even protect workers against arc flash.

Arc Flash

Arc flash can cause severe damage to the human body and in recent years has become the newest challenge to protective clothing.

Timely self-extinguishment and thermal cooling by Kaneka's original FR mechanism.

The melt and drip resistant fabric forms carbon barrier.

Kanecaron
Protex

Applications

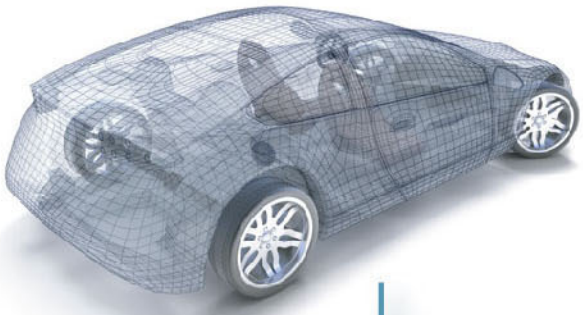
Industrial

Battery material

It is used in electrodes of lead-acid batteries, alkali batteries, and parts of separators.

Automotive

Interior materials

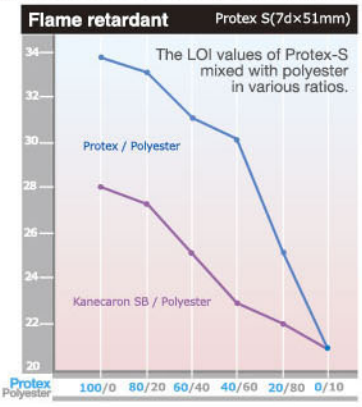


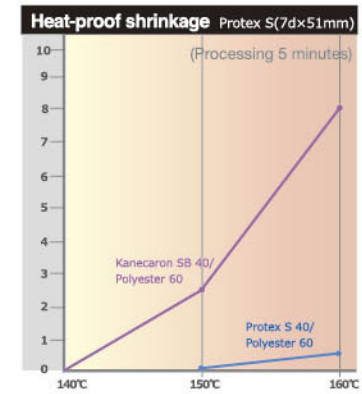
Its high FR and superior processability make Kanecaron/Protex a popular material for automotive interiors.

Filters(Non Woven)

Kanecaron/Protex is often used in non woven air filters that demand high FR quality.

(Blended with polyester)

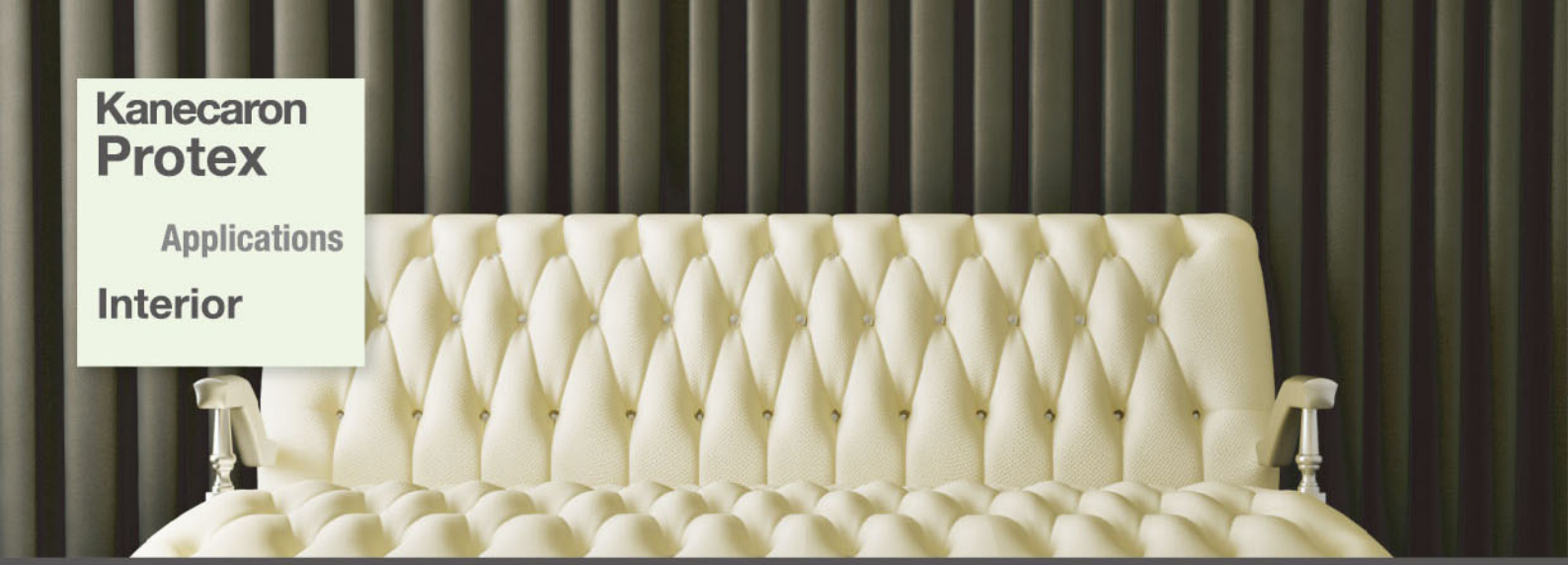




Protex's high FR is sustained even when blended with polyester. Melt, shrink, and chemical resistance makes it possible to create air filters with long-lasting structure and functionality,

Kanecaron/ Protex with its variety of unique attributes is adaptable to numerous industrial applications and has become an essential ingredient in many products.

In addition to its natural attributes, Kanecaron/Protex's ability to impact its properties to blended products opens the door to a host of new industrial applications.



Kanecaron Protex

Applications

Interior

Drapery Carpets
Partitions Upholstery
Wall covering Fabric blinds
Theater curtains and decorations

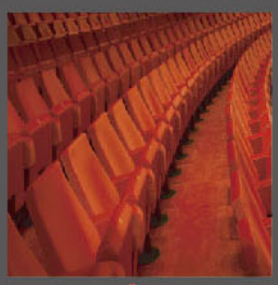
Self-extinguishing ability stops the fire from spreading.

Many large fires start small and spread onto curtains and sofas. Kanecaron/Protex lowers such possibility and minimizes the risk of greater damage.

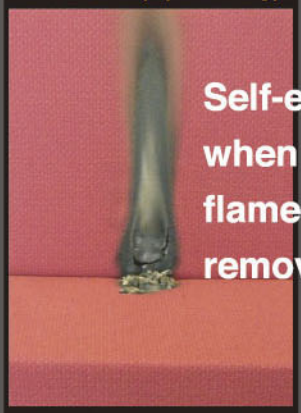
High performance FR products.

Most countries and regions have highly specific and strict FR regulations for large facilities and tall residential buildings.
Kanecaron/Protex has satisfied many of such regulations and is recognized internationally.

■ Kanecaron/Protex's variety of raw materials and their processability allows for creation of beautiful textiles to embellish any styles of interior design, without compromising its high FR.



Kanecaron/Protex
Comubustion Test
on chairs (Upholstery)



Self-extinguishes when flame-source is removed.

Method of exam
BS5852 source.5

High perfomance, comfortable, and attractive Interior goods

Kanecaron Protex

Applications

Bedding & Home Textiles

Blankets Throws Duvet Cover
Comforters Filling Cushions
Mattresses Bed pads Bed sheets
Towels Stuffed toy

Innerwear and linens, frequently washed items

Comfort
Best blended with cotton and other cellulosic fibers

With Kanecaron/Protex beddings and bed linens can be made flame-retardant.

Kanecaron/Protex Mattress Combustion test

Self-extinguished after flame-source is removed.

Method of exam CFR1633

Kanecaron/Protex forms a carbon barrier to prevent of the further spread of fire and ignition of the mattress interior.

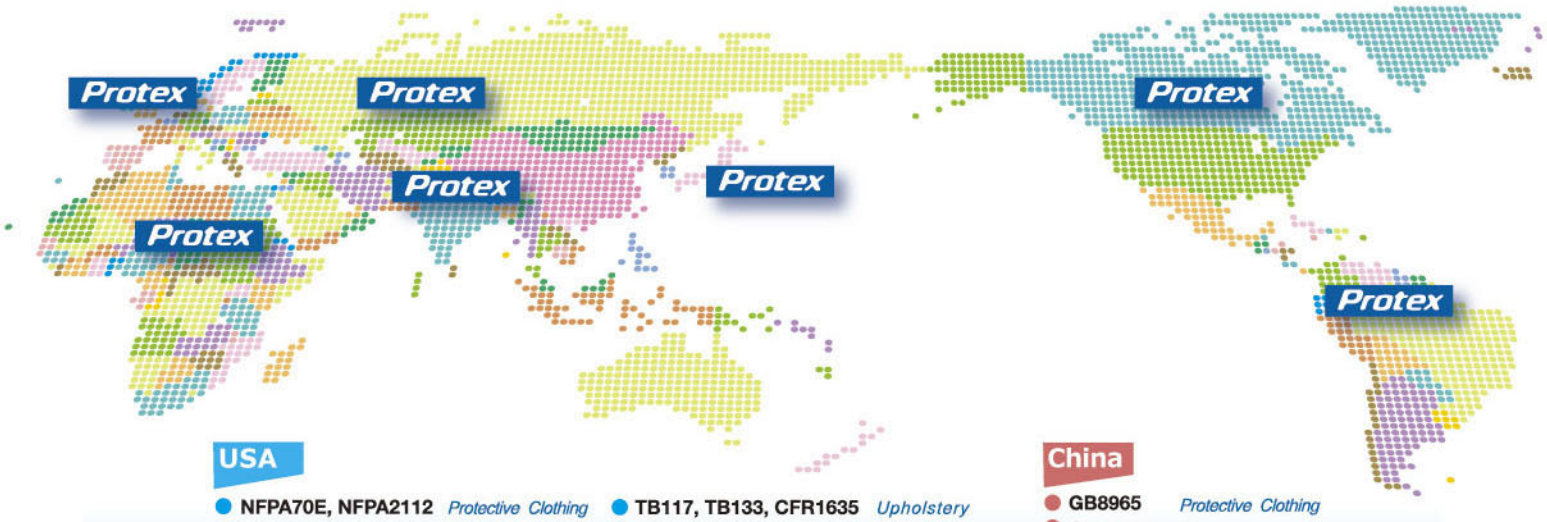
Warm and natural looks and textures of animal fur can be re-created with Kanecaron/Protex.

Stuffed toys made safe by high flame-and-melt retardancy of Kanecaron/Protex

With Kanecaron/Protex an entire bedroom can be made flame retardant from the bedding, linens, to even pajamas.

Kanecaron® Protex® Fiber

Kanecaron · Protex and the world's FR standards.



USA

NFPA70E, NFPA2112	Protective Clothing	TB117, TB133, CFR1635	Upholstery
CFR1615	Pajamas	TB603, CFR1633	Mattresses
NFPA701	Drapery	UL94(V-0, V-1, V-2, VTM)	Industrial
IMO A652(marine)	Upholstery		

China

GB8965	Protective Clothing
GB20286	Drapery
GB20286	Partitions
DL/T-320	Arc Flash

EU

ISO11612	Protective Clothing	NFP 92 503/7 M1	Drapery	BS5852 Source 5	Upholstery
EN469	Protective Clothing	NFP 92 503/7 M2	Upholstery	BS7175	Bedding items
BS5438	Pajamas	BS5852 Source 0,1	Upholstery	BS7177	Mattresses
BS5867 Part2	Drapery				

World

FAR25.853(a)	Blankets
FMVSS-302	Automotive

Kanecaron/Protex has already satisfied numerous FR standards around the world.

In addition to FR application

Pile(Fur fabric)

The ability to recreate in fur fabrics the realistic shine and feel of animal fur is one of Kanecaron's unique advantages.

Hair extentions and wigs

Kanecaron is also used as a realistic alternative to human hair in making of hair extentions, wigs and doll hair.

■ **Contact Info**

Kaneka Corporation Performance Fibers Solutions Vehicle
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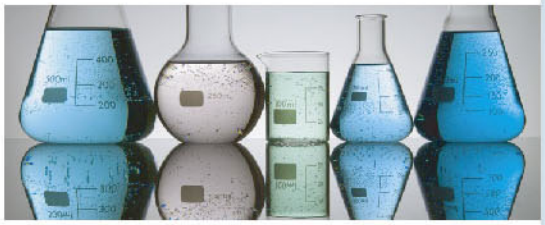
E-mail: fr@kanecaron.com URL: http://www.modacrylic.com

Kanecaron

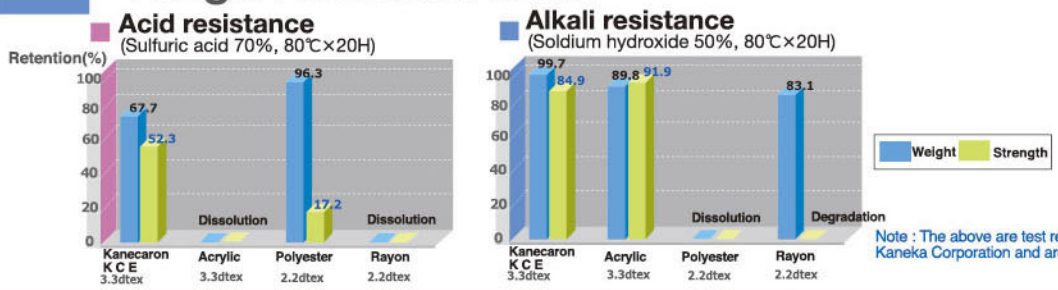
Data: Chemical Resistance

Kanecaron exhibits superior chemical resistance against acid, alkaline, organic and inorganic chemicals and is used commonly in industrial materials(*).

(*)Filters, workwear, battery material, etc.



Acid resistance, Alkali resistance : High retention ratio



Note : The above are test results conducted by Kaneka Corporation and are not guaranteed.

Immersion test results of Kanecaron (K C E 3.3dtex.)

CHEMICALS	Concentration (wt%)	Temperture (℃)	Shrinkage (%)	Retention of Strength (%)	Retention of Break Elongation (%)	Weight Loss (%)	Appearance
INORGANIC ACID							
Aqua Regia	25	100	5.2	93.8	113.4	0.2	*
Chromic Acid	25	50	-4.2	98.9	105.6	0.0	No effect
Hydrochioric Acid	36	100	7.8	85.1	143.1	0.0	* *
Nitric Acid	20	100	6.7	79.6	137.2	0.2	*
Phosphoric Acid	85	100	1.3	88.7	115.0	0.0	*
Sulfuric Acid	70	50	-1.3	108.0	106.6	0.2	*
Sulfuric Acid(100hr.immersion)	40	100	0.7	91.3	117.8	0.0	No effect
ORGANIC ACID							
Acetic Acid	25	100	3.9	89.1	128.4	0.0	*
Acetic Acid	75	100	35.6	57.8	224.1	0.0	* *
Benzene Sulforic Acid	50	50	3.3	97.8	91.9	0.0	No effect
Formic Acid	100	50	108.8	33.8	423.4	6.3	*
Phenolic Acid	5	22	5.6	68.7	123.4	0.0	Phenol color
BASES							
Potassium Hydroxide	25	100	7.5	82.5	112.5	0.0	* *
Potassium Hydroxide	50	50	0.0	95.3	110.0	0.0	No effect
Sodium Hydroxide	25	100	7.8	81.5	103.8	0.0	* *
Sodium Hydroxide	50	50	-2.3	100.4	100.6		No effect
INORGANIC SALTS (In Aqueous Solutions)							
Calcium Thiocyanate	50	100	9.8	84.4	113.1	0.0	
Ferric Nitrate	50	100	3.6	89.8	121.6	0.0	*
Sodium Acetate	50	100	4.6	101.5	115.0	0.0	* *
Sodium Bichromate	50	100	11.4	98.5	116.9	0.0	*
Zinc Chloride	50	100	11.4	96.7	130.6	0.0	* * *
MISCELLANEOUS ORGANIC CHEMICALS							
Acetone	10	50	2.0	96.7	104.4	0.0	No effect
Normal ButyAlcohol	100	100	12.7	84.0	131.9	0.0	No effect
Monoethanolamine	25	50	-1.0	105.8	102.2	0.0	No effect
Diethanolamine	25	50	-1.3	109.8	107.5	0.0	No effect
Triethanolamine	25	50	1.0	102.5	98.8	0.0	No effect
Ethyl Acetate	100	50	-2.6	104.7	99.1	0.0	No effect
Ethyl Alcohol	100	50	-1.3	95.3	101.9	0.0	No effect
Ethylene Glycol	100	100	16.3	79.6	146.6	0.0	* *
Formaldehyde	37	50	-1.3	101.1	99.7	0.0	No effect
Hydrazine	25	50	-19.6	96.7	103.4	0.0	*
Monochloro benzene	100	50	3.9	101.1	118.4	0.0	No effect
Perchloro ethylene	90	50	4.9	98.9	103.8	0.0	No effect
Chloroform	100	22	-3.6	98.9	98.4	0.0	No effect

Special mention:

Certain solvents listed below will dissolve Kanecaron under specific condition;
Acetone,
MEK,
Synchronized hexanone,
Ethylene Carbonate,
DMF,
DMSO,
and others

The number of " * " indicates the level of color change.

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