Customized High-Performance Engineering Plastics Solution Provider

- WDF, Your Trusted Partner -

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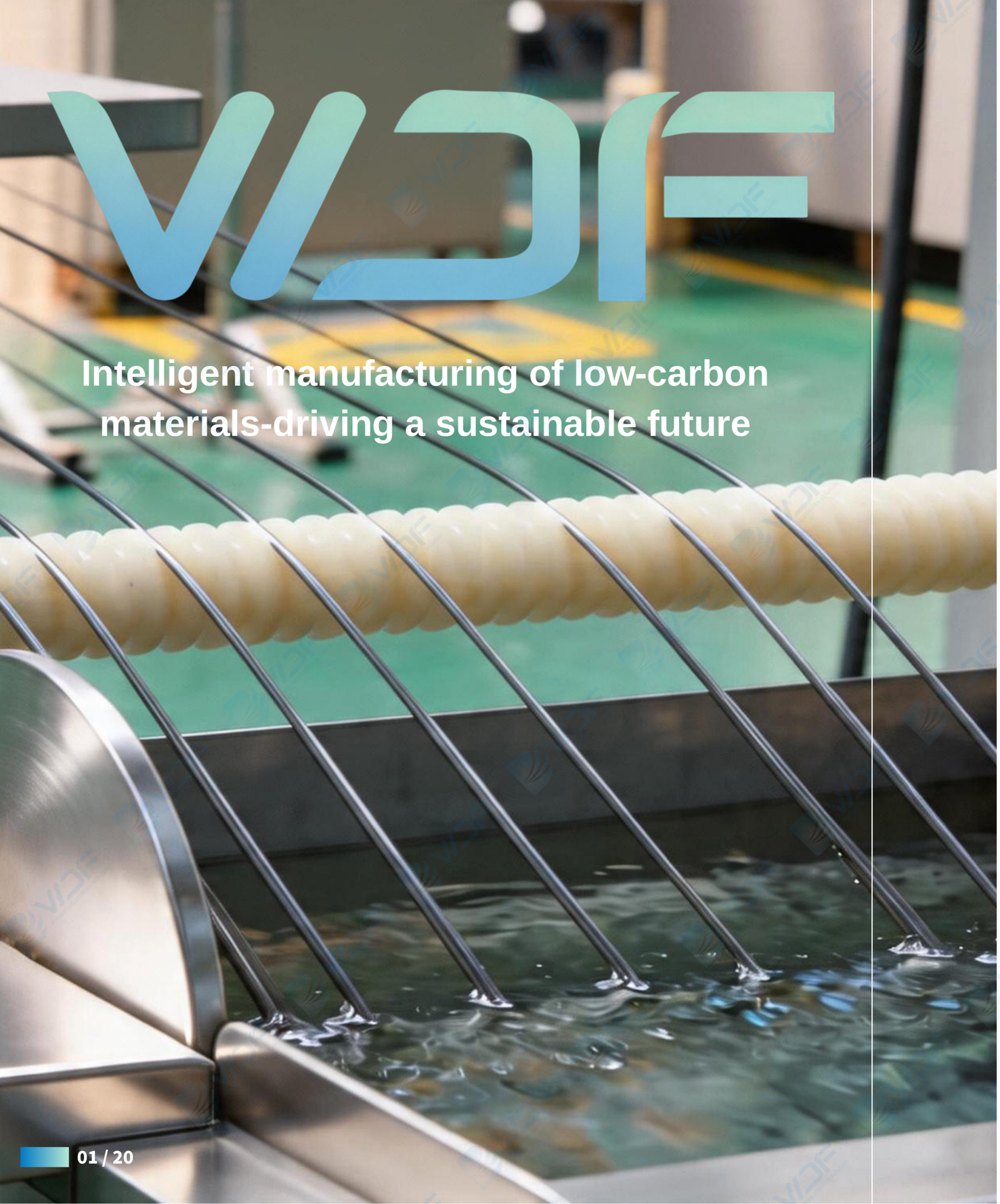
INNOKETONE® PK

Polyketone (PK) brochure

SUZHOU WORLDFUL NEW MATERIALS TECHNOLOGIES CO.LTD
苏 州 沃 德 夫 新 材 料 科 技 有 限 公 司

SUZHOU WORLDFUL NEW MATERIALS TECHNOLOGIES CO.，LTD.
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COMPANY PROFILE

Suzhou Worldful New Material Technology Co., Ltd. (“WDF”), founded in 2022, is an innovative materials company specializing in the R&D, modification, production, and application development of high-performance thermoplastic engineering plastics.

With polyketone (PK) materials as its differentiated core capability, and customized functional materials and sustainable materials as two strategic pillars, WDF has established a “One Core, Two Pillars” materials platform to provide customized high-performance material solutions for strategic emerging industries and critical industrial applications.

CORPORATE CULTURE

VISION

Lead in global low-carbon solutions with superior products and services, creating lasting value.

MISSION

Intelligent manufacturing of low-carbon materials-driving a sustainable future.

VALUES

Customer Success、Agility & Pragmatism、Professionalism & Focus、Long-Termism、Compliance & Discipline、Accountability、Openness & Innovation、Growth & Shared Success



INNOKETONE®PK

Overview of PK Material:

PK (Polyketone) is a linear semi-crystalline highperformance engineering thermoplastic produced through the alternating copolymerization of carbon monoxide, ethylene, and propylene. It features high crystallinity and a compact crystalline structure.

INNOKETONE® is WDF's proprietary brand for modified PK materials . As a new-generation engineering plastic, polyketone (PK) delivers diversified performance while aligning with sustainable development principles of being green, low-carbon, and environmentally friendly.

Due to its unique molecular chain structure, INNOKETONE® PK possesses excellent properties including chemical resistance, wear resistance, hydrolysis resistance, low-temperature impact resistance, low VOCs, and high barrier performance.

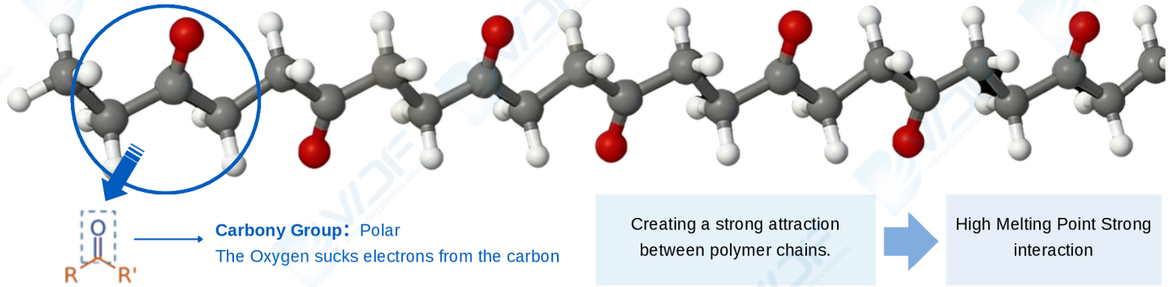


Figure 3.1 PK Molecular Chain Structure

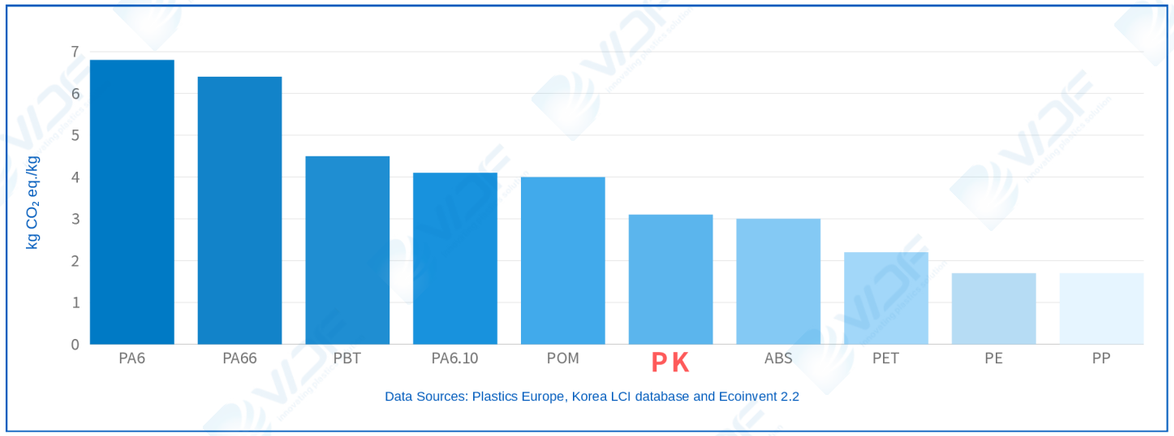


Figure 3.2 Carbon Footprint Comparison

INNOKETONE® PK Material Types:

Modified Resins:

K950	Non-reinforced High-Viscosity PK Resin
K990	Non-reinforced Medium-Viscosity PK Resin
K990GFx	Glass Fiber Reinforced, Standard Fluidity
K990CFx	Carbon fiber reinforced, enhanced mechanical properties
K990MFx	Mineral reinforced, improved thermal stability
K990GMFx	Glass-mineral hybrid reinforced, improved mechanical and thermal stability
K990GFxLW	Glass fiber filled, low-warpage grade
K990GMFxLW	Glass-mineral filled, low-warpage grade
K990TFx	Non-reinforced PTFE Wear-resistant Filled Grade
K990GFxTFx	Wear-resistant filled
K990F-GN	Non-reinforced Halogen-free Flame-retardant Grade
K990GFxF-GN	Glass fiber reinforced, halogen-free flame retardant grade
K990GFx-FD	Food-grade certified

("x" represents different percentage contents of filler materials)

WDF's modification technologies for PK material cover various reinforcement and functional solutions including glass fiber, carbon fiber, mineral, glass-mineral hybrid, low-warpage, wear-resistant, toughened, halogen-free flame retardant, and food-grade composites . We also provide color matching and customized R&D services according to customer requirements.

Please refer to pages 15-18 for details. The material property sheet is attached.

INNOKETONE®PK Material Advantages:

Items		unit	PK	PA6	PA66	PBT	POM
Density		g/cm³	1.24	1.14	1.14	1.30	1.41
Melting point		℃	220	220	260	220	160
Water absorption		%	0.5	2.9	2.5	0.2	0.4
Impact Strength		kJ/m²	9	5.2	4.1	5.0	6.5
Tensile Strength	Dry	MPa	62	80	80	55	65
	Conditionally		60	55	70	-	-
	Wet		58	35	50	-	-
Elongation at break	Dry	%	270	17	19	16	35
	Conditionally		270	40	60	-	-
	Wet		390	360	370	-	-
Flexural Modulus	Dry	MPa	1,570	2,600	2,900	2,400	2,500
	Conditionally		1,560	1,200	2,200	-	-
	Wet		1,550	600	1,100	-	-

Table 4.1 PK Material Performance Data Comparison

- PK material is 12% less dense than POM and 6% less dense than PBT.
- The molecular structure of PK gives it excellent toughness and impact resistance.
- Under different dry/wet test conditions, PK shows smaller mechanical property variations, demonstrating better performance stability than conventional engineering plastics.



Figure 4.2 PK Material Competitive Advantages

INNOKETONE® PK
Wear Resistance Characteristics:

Wear resistance is one of the outstanding properties of INNOKETONE® PK material, preventing debris generation and gear tooth breakage during friction.

Furthermore, INNOKETONE® PK's long-term dimensional stability and low sensitivity to humidity variations enable components to maintain torque and deformation characteristics even under prolonged high-load operation. The material also resists failure from plastic deformation caused by frictional heat or external pressure, while simultaneously reducing operational noise.

Test method:
Gear-to-gear wear test

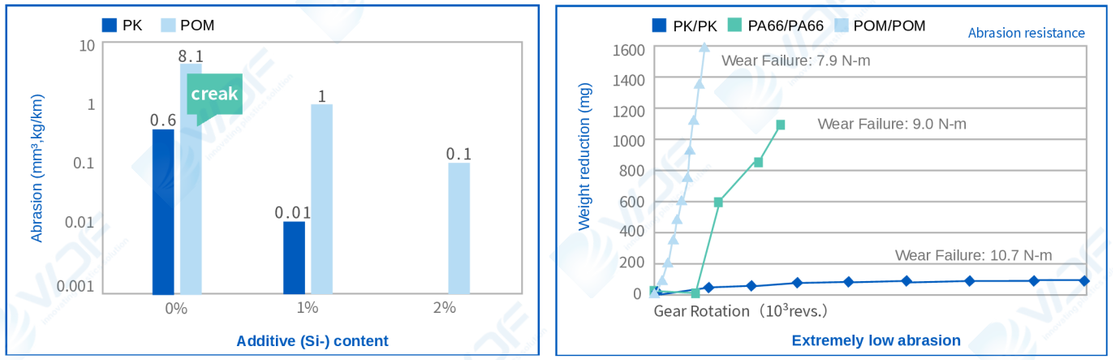


Figure 5.1 Wear resistance test data comparison

These advantages enable PK to be applied in fields such as pulleys, gears, and bearing bushings:

- Compared to traditional materials like POM and nylon, PK is more suitable for solving issues like wear debris, gear tooth breakage, and noise reduction.
- Compared to PA12 and TPEE, PK better addresses problems such as insufficient product torque and wear resistance.
- Compared to conventional soft noise-damping materials, PK is more effective in overcoming limitations like inadequate wear resistance, fatigue resistance, and lubricant-induced swelling.

In enhancing material wear resistance, PTFE(polytetrafluoroethylene) is commonly used as a filler. However, as global regulations on per- and polyfluoroalkyl substances (PFAS) become increasingly stringent, there is growing demand for materials free from PTFE - since PTFE itself belongs to the PFAS family.
PFAS have hazards including persistence, long-distance migration, bioaccumulation, and toxicity, which can adversely affect the environment and human health, posing risks such as endocrine disruption, immune system damage, and cancer.

Hazards of PFAS to Human Health:



Consequently, while enhancing material wear resistance, WDF has also responded to market demand for environmentally friendly products by introducing a new modified PK wear-resistant category: fluorine-free wearresistant grade:

(1) PK + Special Compounds
(2) PK + Wear-Resistant Additives
These two material categories achieve both fluorine-free formulation and superior wear resistance compared to traditional PTFE-filled materials. They are suitable for highwear applications such as gears and gaskets, providing customers with more environmentally friendly alternatives.

INNOKETONE® PK
Hydrolysis Resistance:

Hydrolysis refers to the degradation phenomenon that occurs when materials come into contact with water or water vapor, typically leading to reduced strength, rigidity, and durability. Compared to conventional plastics, PK material demonstrate significantly stronger resistance to both moisture absorption and hydrolytic reactions.

INNOKETONE® PK materials maintain excellent physical and chemical stability in wet or water-exposed environments, outperforming many conventional engineering plastics. At room temperature (23°C), PK material exhibits significantly less mechanical property degradation after long-term water immersion compared to nylon and polyester materials. Its outstanding long-term hydrolysis resistance is comparable to that of PPS and PPO.
Even under prolonged immersion in hot water, the material exhibits minimal degradation in mechanical properties, demonstrating outstanding hydrolysis resistance.

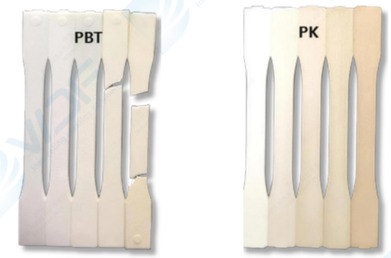


Figure 6.1
100°C, 100% RH, 4-Week Constant Temperature and Humidity Test(From left to right: Material changes over weeks 0 to 4)

According to the test results, PBT degraded due to hydrolysis, causing test specimens to fail by the third week . While PBT performed better in color retention,PK demonstrated superior property retention .

Overall, INNOKETONE® PK exhibits excellent creep resistance and dimensional stability in both ambient and hot water environments, making it suitable for applications such as automotive water chambers, intercoolers, and hot water meters.

Testing of PK material for automotive cooling system under the following conditions:

- Temperature: 135°C
- Coolant: G12 evo/water (50/50 mixture)
- Requirement: Retain flexural strength > 25 MPa after 1000 hours

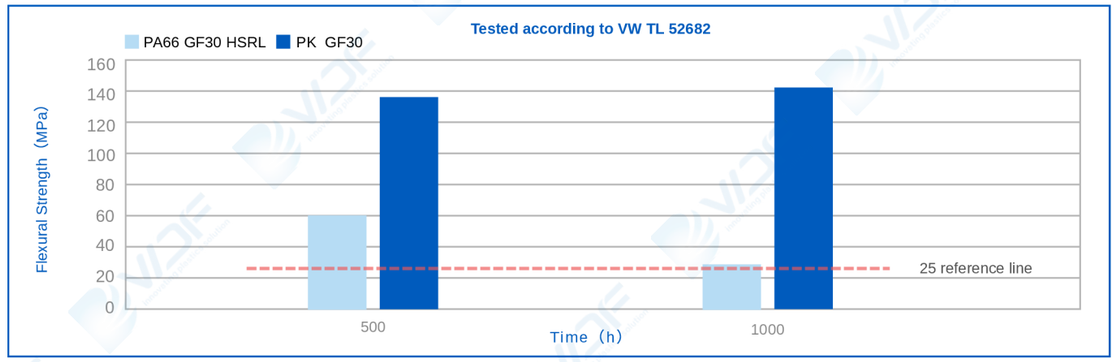


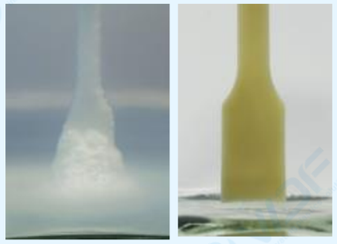
Figure 6.2 Automotive Cooling System Test Data

After 1,000 hours of testing, the flexural strength of PA66 GF30 HSRL decreased significantly, approaching the reference line. In contrast, PK GF30 showed minimal change in flexural strength and was consistently higher than PA66 GF30 HSRL at corresponding time points.
PK GF30 demonstrates excellent hydrolysis resistance and durability, making it well-suited for high-demand applications requiring long-term exposure to coolant.

INNOKETONE® PK Chemical Resistance:

INNOKETONE® PK material boasts excellent chemical resistance, effectively resisting the corrosion of various chemical substances.

The PK backbone is made up of C-C linkages, allowing it to maintain outstanding stability when exposed to acids, bases, salts, solvents, and other chemicals (except for strong acids and strong bases). Its chemical resistance is comparable to that of PPS, providing enhanced safety and durability in complex chemical environments.



After 24 hours of immersion in 38% H_2SO_4 , the PA66 GF30 specimen (left) degraded,while the PK GF30 specimen (right) remained unchanged.

Figure 7.1 24-Hour Immersion in 38% H_2SO_4: PA66 GF30 vs. PK GF30

PK and other materials chemical resistance comparison

	Semi-crystalline							Amorphous		
	PK	PA66	PA12	POM	PBT	PPS	PVDF	PPO	PSU	PC
Hydrocarbons										
Aliphatic	+	+	+	+	+	+	+	○	○	○
Aromatic	+	+	+	+	+	+	+	○	○	○
Halogenated	+	+	○	+	○	+	+	○	○	○
Ketones	+	+	+	+	+	+	○	○	○	○
Esters/ethers	+	+	+	+	+	+	+	○	○	○
Aldehydes	+	○	○	+	+	+	+	○	○	○
Aqueous										
water	+	○	+	+	○	+	+	+	+	+
Weak acids	+	○	○	○	○	+	+	+	+	+
weak bases	+	○	○	+	○	+	○	+	○	+
Strong acids	○	○	○	○	○	○	+	+	○	+
Strong bases	○	○	○	+	○	○	○	○	○	○

+ Resistant ○ Non-resistant **Note:** Comparative ratings incorporate temperature influences.

Comparison of Property Retention Rates for PK, PBT, and PA66 Materials in Different Solutions

Solution	Unit	PK			PBT			PA66		
		0hr	240hrs	Retention rate	0hr	240hrs	Retention rate	0hr	240hrs	Retention rate
1% HCl	MPa	60	60	100%	55	51	93%	80	65	81%
1% NaOH		60	60	100%	55	54	98%	80	65	81%
5% $CaCl_2$		60	60	100%	55	50	91%	80	66	83%
Gasoline		60	65	108%	55	54	98%	80	80	100%
85℃，Distilled water		60	60	100%	55	52	95%	80	38	48%

* Some material property data sourced from HYOSUNG

Chemical Substance	Concen - tration	Tempera- ture(°C)	Time (days)	Appearance
Ethyl acetate	100%	23	365	Unchanged
Butyl acetate	100%	23	365	Unchanged
Propylene carbonate	100%	23	365	Unchanged
Acetic acid	5%	23	365	Unchanged
Formic acid	10%	23	365	Unchanged
Dichlorobenzene	100%	23	365	Unchanged
Dichloromethane	100%	23	365	Unchanged
	100%	80	100	Pale yellow
Trichloroethane	100%	80	300	Pale yellow
Trichloroethylene	100%	23	100	Unchanged
Tetrachloroethylene	100%	23	300	Unchanged
Carbon tetrachloride	100%	23	365	Unchanged
Gasoline + (10% ethanol)	100%	23	763	Pale yellow
	100%	45	300	Pale yellow
Gasoline +(15% methanol)	100%	95	40	Unchanged
Gasoline +(15% MTBE)	100%	95	40	Unchanged
Tomato sauce	100%	23	365	Pale yellow
Lactic acid	20%	23	365	Unchanged
Beer	100%	23	365	Pale yellow
Hydrochloric acid	1%	23	365	Unchanged
Ammonium sulfate	20%	23	100	Pale yellow
Sulfuric acid	30%	23	100	Pale yellow
Sodium bisulfite	20%	23	100	Unchanged
Hydrogen peroxide	3%	23	100	Pale yellow
Ferrous sulfate	20%	23	365	Unchanged
Water	100%	23	365	Unchanged
Seawater	100%	23	365	Unchanged
Barium hydroxide	10%	23	365	Pale yellow
Potassium hydroxide	45%	23	100	Unchanged
Copper chloride	20%	23	100	Pale yellow
Calcium chloride	30%	23	320	Unchanged
Calcium hydroxide	2%	23	365	Pale yellow

Chemical Substance	Concen - tration	Tempera- ture(°C)	Time (days)	Appearance
Antifreeze agent	100%	23	365	Faint green
	100%	45	100	Unchanged
Antifreeze agent	50%	23	763	Unchanged
	50%	45	300	Pale yellow
Transmission fluid	100%	45	460	Pale yellow
n-Butane	100%	23	365	Unchanged
Heptane	100%	23	300	Unchanged
	100%	80	100	Pale yellow
Hexane	100%	23	365	Unchanged
Acetone	100%	50	300	Pale yellow
Dimethylformamide (DMF)	100%	23	100	Unchanged
Dimethyl sulfoxide(DMSO)	100%	23	365	Unchanged
Ethylene glycol	100%	23	763	Unchanged
Ethanol	100%	23	365	Unchanged
Methanol	100%	23	365	Unchanged
Isopropanol	100%	23	365	Unchanged
Special hydraulicfluid	100%	45	300	Unchanged
Anisole	100%	23	365	Unchanged
Benzaldehyde	100%	23	365	Unchanged
Toluene	100%	23	365	Unchanged
Gasoline	100%	23	365	Pale yellow
	100%	45	360	Pale yellow
	100%	80	100	Milky White
	100%	90	40	Unchanged
Methyl tert-butyl ether (MTBE)	100%	23	365	Unchanged
Methyl ethyl ketone (MEK)	100%	23	365	Unchanged
	100%	80	100	Unchanged
N-Methyl-2-pyrrolidone (NMP)	100%	23	100	Unchanged
Methyl ethyl ketone (MEK)	100%	23	365	Unchanged
	100%	80	100	Unchanged
Detergent	5%	23	365	Unchanged

Table 9.1 Appearance Resistance of PK Material in Various Solutions

INNOKETONE® PK Low VOC & Low Odor:

Thanks to its proprietary manufacturing process and eco-friendly formulation, INNOKETONE® PK exhibits minimal molecular leaching and volatilization. Free from five benzenes and three aldehydes, it complies with global automotive VOC standards, making it a truly low-odor, lowemission green material solution.

Additionally, its low-odor characteristics enable easy compliance with industry-standard odor tests such as VDA 270. PK materials are particularly suitable for automotive interior applications, offering safer and more eco-friendly solutions compared to conventional materials like POM and ABS.

SGS Test Report
No. : F69010/LF-CTSAYAA16-33737

Sample Identification	AYAA16-33737.001		Sample Name	Polyketone	
Environment	23 ± 2℃		Sample size	5g	
Sample bagsize /Samplingvolume	3L/1L (N2)		Analysis conditions	65℃, 2h	
Analyte	Test Method	Unit	MDL	Limit	Result
Benzene	MS 300-55:2014, Tenax tube,GC/MS	μg/m³	10	30	N.D
Toluene	MS 300-55:2014, Tenax tube,GC/MS	μg/m³	10	1000	73.3
Ethylbenzene	MS 300-55:2014, Tenax tube,GC/MS	μg/m³	10	1000	N.D
Xylene	MS 300-55:2014, Tenax tube,GC/MS	μg/m³	20	870	N.D
Styrene	MS 300-55:2014, Tenax tube,GC/MS	μg/m³	10	220	N.D
Formaldehyde	MS 300-55:2014, DNPH Cartridge, HPLC	μg/m³	20	210	N.D
Acetaldehyde	MS 300-55:2014, DNPH Cartridge, HPLC	μg/m³	20	50	N.D
Acrolein	MS 300-55:2014, DNPH Cartridge, HPLC	μg/m³	20	50	N.D

Table 9.1 VOC Emission Testing

INNOKETONE® PK Barrier Properties:

INNOKETONE® PK demonstrates excellent barrier properties, effectively blocking moisture, oxygen, and organic substances, showcasing superior barrier performance and sealing effectiveness, with barrier efficacy comparable to EVOH.

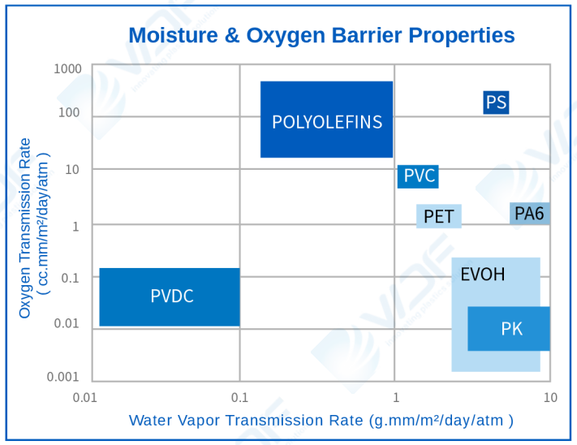


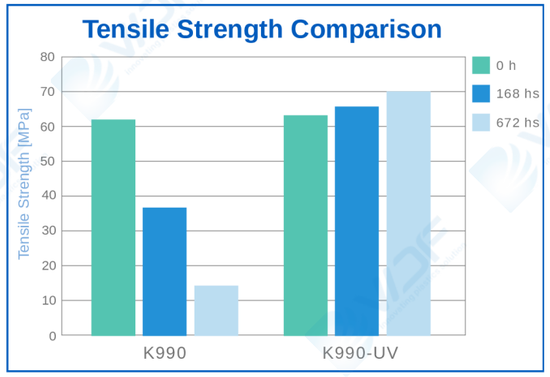
Figure 9.2 PK Material Barrier Performance Comparison

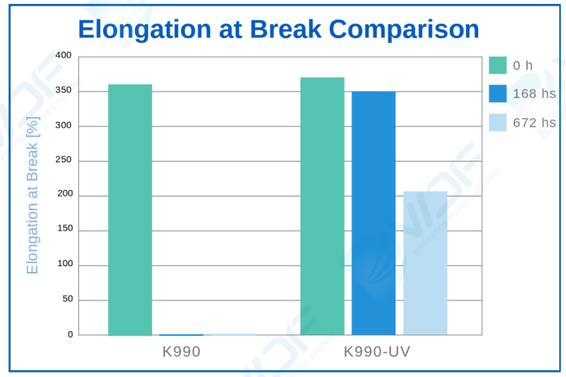
INNOKETONE® PK can be processed via extrusion, injection molding, and other forming techniques to produce products with excellent sealing and barrier properties. It is suitable for automotive fuel systems, packaging films, cosmetic containers, and other applications, providing effective permeation barriers and enhanced safety.

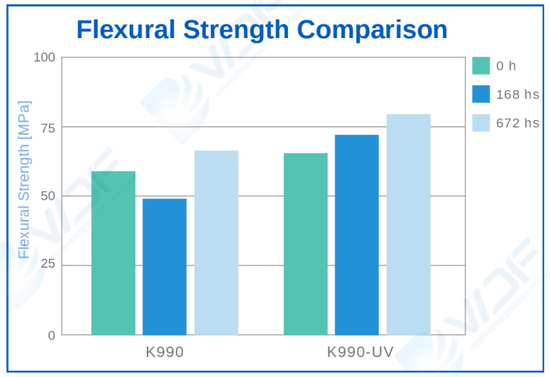
INNOKETONE® PK UV Resistance:

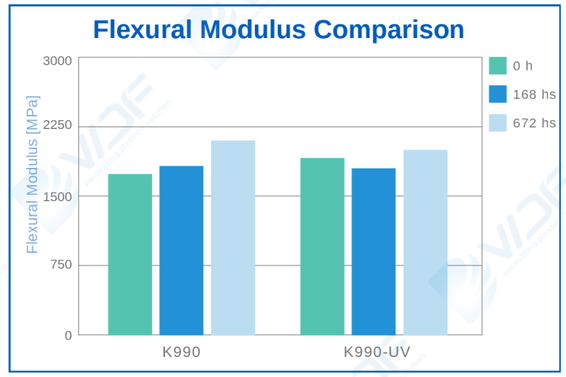
INNOKETONE® PK exhibits significantly enhanced UV resistance after weathering modification, maintaining high strength retention during long-term use, effectively extending product service life.

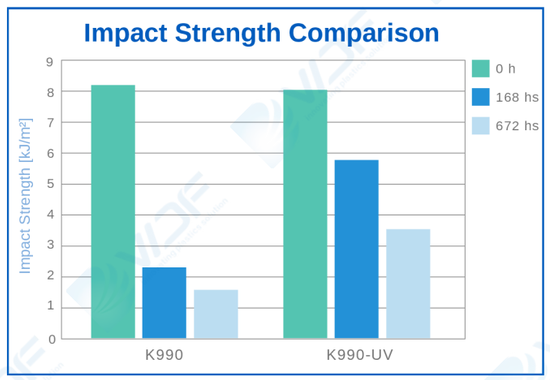
QUV test (UVA lamp, 340 nm wavelength, irradiance 0.68 W/m², 60°C, 672 h)











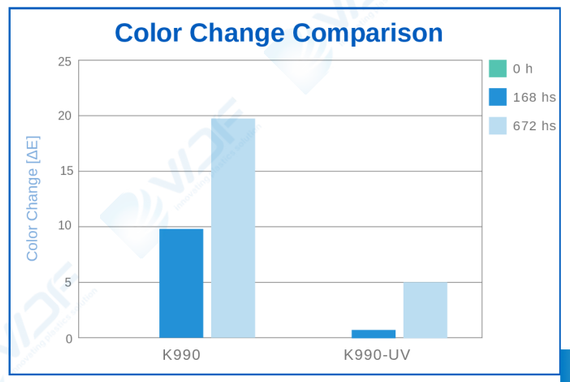
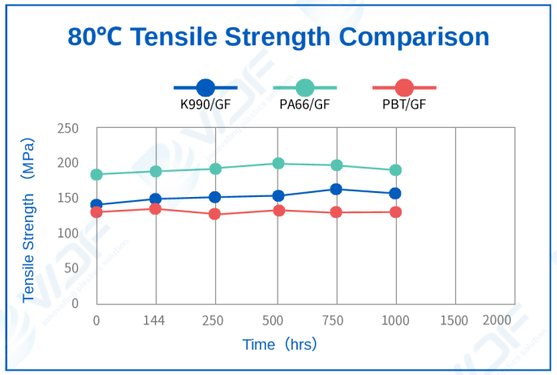


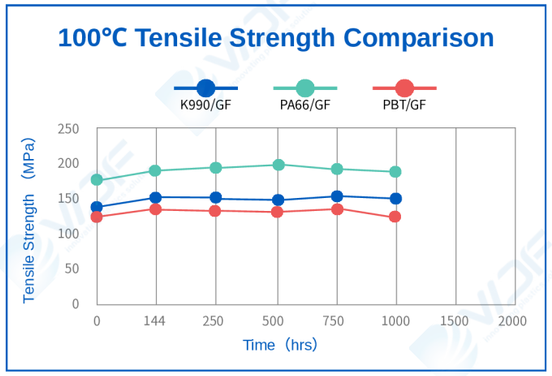
Figure 10.1 PK material mechanical properties data results diagram

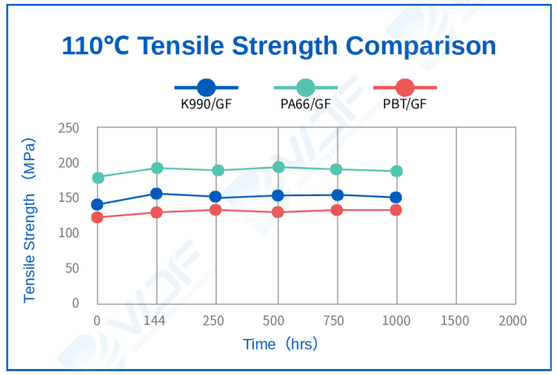
INNOKETONE® PK Thermal Stability:

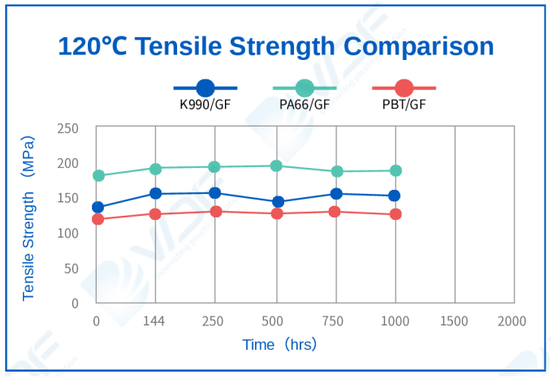
INNOKETONE® PK has a long-term service temperature of 125°C . Test results demonstrate high mechanical strength retention at this temperature, making it suitable for applications such as engine compartment components.

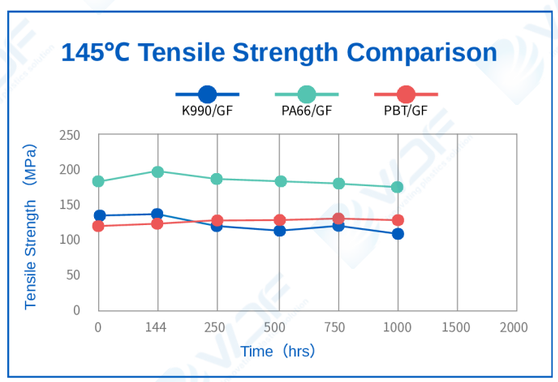
1000h Heat Resistance Tensile Strength Test Comparison











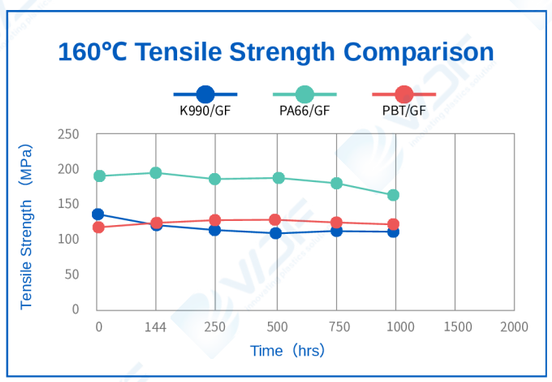


Figure 11.1 Comparison of tensile strength after 1000h heat resistance test

INNOKETONE® PK Electrical Properties:

INNOKETONE® PK has low water absorption and excellent electrical insulation properties.Even after long-term immersion in hot and cold water, it maintains significantly higher electrical resistance retention compared to PA materials. It can be used in circuit breakers, electronic connectors, railway fasteners, and other applications.

Modified PK meets CTI ≥ 600V requirements, making it applicable for high-voltage electrical equipment such as switches, insulators, transformers, and cable joints.

INNOKETONE® PK Flame retardancy:

Flame-retardant modified PK materials exhibit excellent flame-retardant performance, meeting high-standard flame-retardant requirements. Compared to PA6, the same level of flame retardancy can be achieved with 50% less flame retardant additive. This reduction helps maintain the material's mechanical properties, preventing brittleness caused by excessive flame retardant additives, while also improving the material's environmental friendliness.

GWIT Performance:

The GWIT (Glow-Wire Ignition Temperature) of INNOKETONE® PK material can reach 725°C (2mm), with some flame-retardant series achieving up to 900°C (2mm). This ensures outstanding resistance to ignition in high-temperature environments, providing enhanced safety for electrical and electronic equipment.

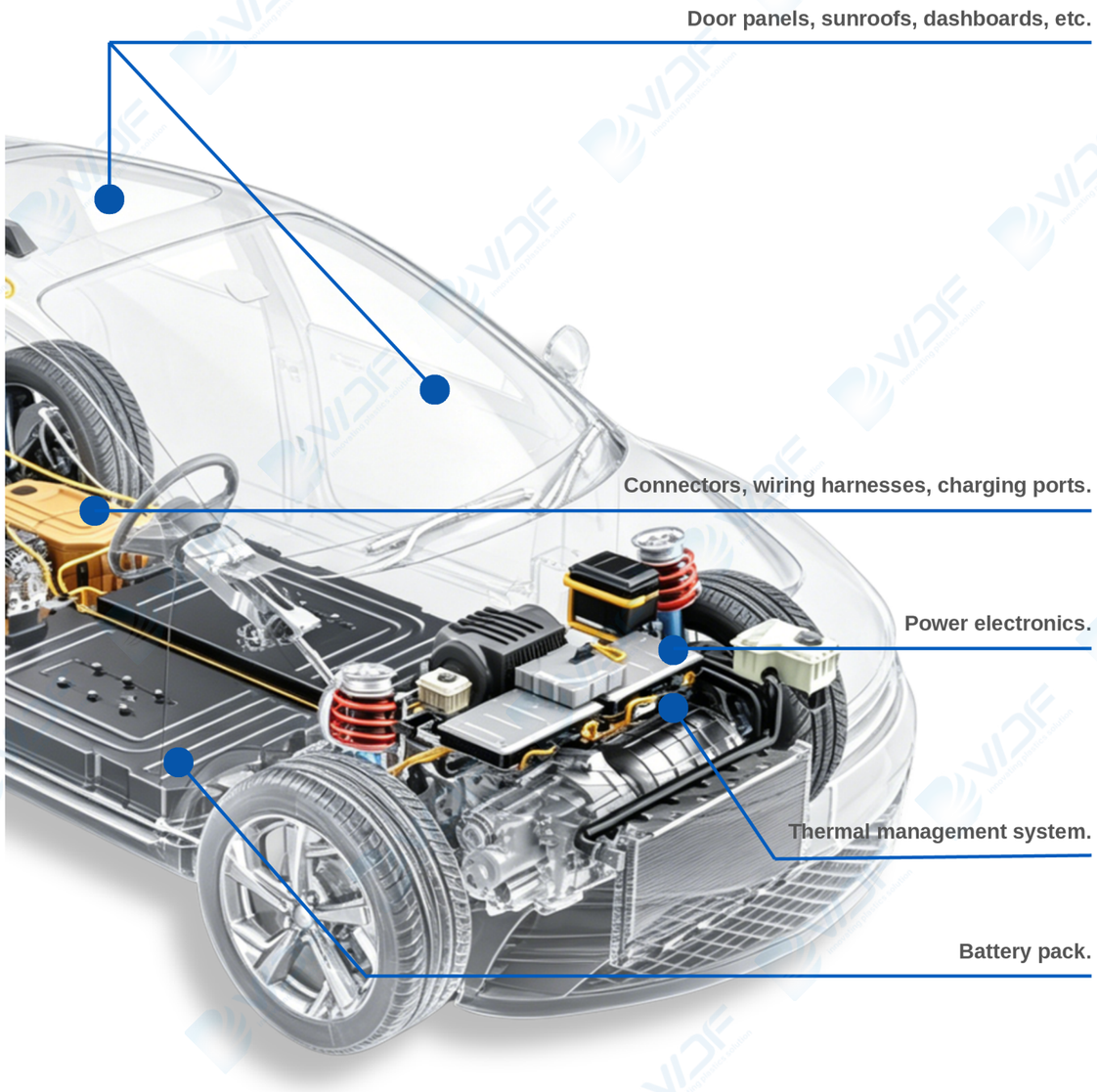
Example：K990GF30F-GN is a flame-retardant, high-flow injection molding grade launched by WDF:

- ▶ Excellent mechanical properties
- ▶ UL94 V-0 at 0.8mm
- ▶ High CTI & High GWIT
- ▶ Low smoke density
- ▶ Low toxicity
- ▶ Low moisture absorption
- ▶ Good toughness
- ▶ Excellent chemical resistance

These outstanding features make it suitable for applications in the automotive, electrical, electronic, industrial, and consumer goods markets.

INNOKETONE® PK APPLICATION

• Automotive Industry



• Home Appliance Industry

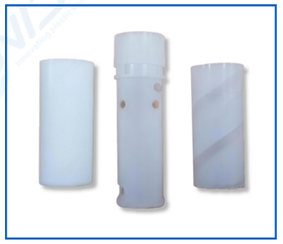
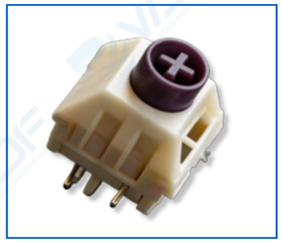


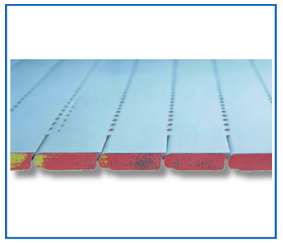





• Other Industries



INNOKETONE® PK
Material Property Table:

Material Properties Type				Non-reinforced		Mineral Reinforced	Glass Fiber Reinforced					Low Warpage						Carbon Fiber Reinforced
Items	Standard	Condition	Unit	K990	K950	K990MF20	K990GF10	K990GF20	K990GF30	K990GF40	K990GF50	K990GF10LW	K990GF20LW	K990GF30LW	K990GF40LW	K990GF50LW	K990GF60LW	K990CF20
Characteristics				Standard Viscosity	High Viscosity	20%MF	10%GF	20%GF	30%GF	40%GF	50%GF	10%GF	20%GF	30%GF	40%GF	50%GF	60%GF	20%CF
Physical properties																		
Specific Gravity	ISO 1183	23℃	g/cm³	1.24	1.24	1.40	1.3	1.39	1.48	1.58	1.69	1.31	1.38	1.48	1.57	1.68	1.80	1.32
Molding Shrinkage	Internal	2mm, flow	%	1.6	1.6	1.2-1.4	0.7-0.9	0.4-0.6	0.3-0.5	0.2-0.4	0.1-0.3	0.6-0.8	0.4-0.6	0.3-0.5	0.2-0.4	0.1-0.3	0.1-0.3	0.4-0.6
		2mm, transverse		1.5	1.5	1.2-1.4	1.2-1.4	0.9-1.1	0.8-1.0	0.6-0.8	0.6-0.8	1.0-1.2	0.8-1.0	0.7-0.9	0.5-0.7	0.4-0.6	0.2-0.4	0.9-1.1
Mechanical properties																		
Tensile Strength	ISO 527-2	10mm/min	MPa	60	58	52	85	120	135	160	165	80	100	125	145	160	160	135
Elongation at Break	ISO 527-2	10mm/min	%	≥200	≥200	12	6.0	3.5	3.0	2.5	2.2	5.0	3.5	2.6	3.5	2.5	2.0	2.0
Flexural Strength	ISO 178	2mm/min	MPa	57	53	70	125	175	195	220	230	125	150	180	200	230	260	185
Flexural Modulus	ISO 178	2mm/min	MPa	1400	1250	2500	3000	5000	6900	9000	12000	3300	4500	6600	8500	11000	14000	12000
Izod Impact Notched	ISO 180	23℃	kJ/m²	7	15	8	12	15	14	16	15	9	11	15	16	20	20	8
Izod Impact, Unnotched	ISO 180	23℃	kJ/m²	NB	NB	70	58	60	70	58	59	25	40	50	35	/	/	/
Thermal properties																		
Flammability	UL94	3.2 mm	Class	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
Flammability	UL94	1.6 mm	Class	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
Flammability	UL94	0.8mm	Class	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
Heat Deflection Temperature,unannealed	ISO 75	1.8MPa	℃	92	90	100	195	210	210	210	210	195	210	210	210	210	210	210
GWIT	IEC 60695-2-13	2mm	℃	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
Electrical properties																		
CTI	IEC 60112	50 drops	V	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Volume Resistivity	IEC 60093	23℃	ohm ·cm	1x10^14	1x10^14	1x10^13	1x10^14	1x10^13	1x10^13	1x10^14	1x10^13	1x10^13	/	1x10^13	1x10^13	/	/	/
Dielectric Strength	ASTM D149	2mm	KV/mm	23	19	/	19	14	17	16	19	17	/	14	17	/	/	/
Wear Resistance																		
Wear Resistance	Internal	196N, 200r/min, 120min	Wear Loss (mg)	＜10	＜10	/	75	75	80	140	145	/	/	/	/	/	/	/
	Internal		COF	0.13	0.12	/	0.22	0.23	0.25	0.26	0.26	/	/	/	/	/	/	/

INNOKETONE® PK
Material Property Table:

Material Properties Type				Flame Retardant							Super Wear-resistant.							Special Grade		
Items	Standard	Condition	Unit	K990F -GN	K990GF5F -GN	K990GF10F -GN	K990GF15F -GN	K990GF20F -GN	K990GF25F -GN	K990GF30F -GN	K950-SI	K950-W	K950U5	K990TF10	K990TF20	K990GF 25TF10	K990CTF1010	K990-FD	K950-FD	K990-UV
Characteristics				Halogen-free	Halogen-free, Glass Fiber Reinforced						Silicone oil	Wear-resistant additive	Special compound	PTFE-filled			Carbon fiber, PTFE-filled	FDA grade		UV resistance
Physical properties											Physical properties									
Specific Gravity	ISO 1183	23℃	g/cm³	1.25	1.29	1.31	1.34	1.38	1.42	1.47	1.24	1.25	1.22	1.29	1.34	1.50	1.32	1.24	1.24	1.24
Molding Shrinkage	Internal	2mm, flow	%	1.2-1.5	0.8-1.2	0.6-0.9	0.4-0.8	0.3-0.6	0.3-0.6	0.3-0.5	1.5-1.7	1.4-1.6	1.4-1.6	1.5-1.7	1.5-1.7	0.3-0.5	0.3-0.5	1.6	1.6	1.6
		2mm, transverse		1.2-1.5	0.8-1.2	0.6-1.1	0.6-1.0	0.6-1.0	0.6-0.9	0.6-0.9	1.5-1.7	1.4-1.6	1.4-1.6	1.5-1.7	1.5-1.7	0.8-1.0	0.7-0.9	1.5	1.5	1.5
Mechanical properties											Mechanical properties									
Tensile Strength	ISO 527-2	10mm/min	MPa	52	60	79	96	110	120	130	57	56	58	50	47	120	105	60	55	55
Elongation at Break	ISO 527-2	10mm/min	%	23	7.5	5.2	4.3	3.8	3.6	3.5	≥30	≥200	≥50	50	≥20	3.5	1.8	300	300	300
Flexural Strength	ISO 178	2mm/min	MPa	58	90	125	145	170	180	190	60	52	60	50	47	175	150	57	55	55
Flexural Modulus	ISO 178	2mm/min	MPa	1700	2500	3400	4200	5500	6500	7000	1380	1200	1500	1250	1250	5700	7000	1400	1250	1250
Izod Impact Notched	ISO 180	23℃	kJ/m²	9	8	9	11	12	13	14	15	25	9	10	12	14	10.0	7	15	15
Izod Impact, Unnotched	ISO 180	23℃	kJ/m²	80	45	49	54	64	65	60	NB	NB	NB	NB	NB	60	30	NB	NB	NB
Thermal properties											Thermal properties									
Flammability	UL94	3.2 mm	Class	V-0	V-0	V-0	V-0	V-0	V-0	V-0	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
Flammability	UL94	1.6 mm	Class	V-0	V-0	V-0	V-0	V-0	V-0	V-0	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
Flammability	UL94	0.8mm	Class	V-0	V-0	V-0	V-0	V-0	V-0	V-0	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
Heat Deflection Temperature,unannealed	ISO 75	1.8MPa	℃	85	160	180	200	208	210	210	90	90	/	87	88	210	210	92	90	90
GWIT	IEC 60695-2-13	2mm	℃	775	775	775	775	775	775	800	725	/	/	725	725	725	725	725	725	725
Electrical properties											Electrical properties									
CTI	IEC 60112	50 drops	V	600	600					600	600	/	/	600	600	600	600	600	600	600
Volume Resistivity	IEC 60093	23℃	ohm ·cm	1x10^14	/	/	/	/	/	1x10^13	/	/	/	1x10^14	1x10^14	1x10^13	1x10^3	/	/	1x10^13
Dielectric Strength	ASTM D149	2mm	KV/mm	13	/	/	/	/	/	16	/	/	/	15	14	14	/	23	19	14
Wear Resistance											Wear Resistance									
Wear Resistance	Internal	196N, 200r/min, 120min	Wear Loss (mg)	/	/	/	/	/	/	/	/	/	/	220	250	75	130	/	/	/
	Internal		COF	/	/	/	/	/	/	/	/	/	/	0.08	0.09	0.08	0.08	/	/	/

WDF has been certified:





Certifications already passed

ISO45001、 ISO14001、ISO9001: 2015、GRS
ISO37301、ISO37001、 IATF16949：2016、ISO50001

The material has been certified:

Certified by EU RoHS, REACH, PAHS, and TSCA.

Food contact certified

Certified by China CQC.

Certified by UL.





In the future, WDF will continue to optimize the environmental and safety standards of both the company and its materials, ensuring that its products comply with international industry regulations.