SANEXIN
善信

善信高性能环保阻燃剂产品介绍

Introduction to Sanexin High-Performance Environmentally Friendly Flame Retardants

至诚Sincere　　开放Open　　共赢Win-Win

---- 橡胶解决方案的服务商

Rubber Solution Provider

Anhui Sanexin Polymer Fine Material Co.,Ltd

FR lab

FR production line

Comply with laws and regulations

RoHS Directive 2011/65/EU WWW.RoHS.PW CE

PAHS

UL

REACH

POWERFLEX 玄珞

Main featurers

High efficiency, no halogen, low smoke, environmental protection

- N kinds of coordination - high flame retardant efficiency - the addition amount is relatively small
- Raw material 100% surface treatment - good dispersion
- Flame retardant particle size, good physical properties of the vast majority of raw materials, from abroad - global raw material selection
- Flame-retardant application practice rich - total solution .Full range of products, more targeted

Manufacturers of high efficiency and environmental protection halogen-free flame retardants:
Widely used: EPDM NBR NR SBR PVC CPE VMQ, etc

Flame retardant with high efficiency, excellent physical properties, and high whiteness.

Flame retardant with high efficiency, high oxygen index, and high whiteness.

FR99RP vs. FR98RP Comparison – In EPDM 70 Shore A Base Formulation with Flame Retardant

Test Data					
Rheometer Test 180℃×5min					
Test Item	Unit	FR98RP-80	FR99RP-80	FR98RP-100	FR99RP-100
Cure Curve					
ML	lbf-in	0.92	0.9	1.09	1.04
MH	lbf-in	11.18	12.55	11.27	14.62
MH-ML	lbf-in	10.26	11.65	10.18	13.58
TS2	sec	59	41	63	41
TC10	sec	50	35	51	36
TC90	sec	207	96	221	112
Conventional Physical Properties Test 175℃×6min					
Hardness (Shore A)	-	74	74	78	76
Tensile Strength	MPa	7.63	9.26	6.35	9.32
Elongation at Break	%	406	421	417	497
M100	MPa	2.64	2.77	2.59	2.69
Specific Gravity	g/cm³	1.22	1.238	1.241	1.242
Flame Retardancy Test					
Vertical Burning (UL94 V0)	-	V-0	V-0	V-0	V-0
Oxygen Index (LOI)	%			42.3	35.4
Heat Air Aging Test 100℃×70h					
Hardness (Shore A)	-			83	79
Hardness Change	-			5	3
Tensile Strength	MPa			5.87	8.99
Tensile Strength Change	%			-7.56	-3.54
Elongation at Break	%			275	406
Elongation at Break Change	%			-34.05	-18.31
Compression Set 120℃×24h					
Compression Set	%	/	/	52.94	31.43
Resilience	%			37	47

FR99RP vs. FR98RP Comparison – In EPDM 70 Shore A Base Formulation with Flame Retardant

# Test Formulation 1 (EPDM 70 Shore A)	
Material Name	Basic Parts, phr
KEP350	50
TER 4038	50
CZ500R	40
Precipitated Calcium Carbonate	20
Flame Retardant (FR98 / FR99)	80 / 100
Paraffinic Oil 6030#	15
ZNO	6
STA	1.5
PEG4000	2
L-24	1
S-80	1.25
EP-33	2.5

Conclusion:

A 70 Shore A EPDM base formulation was selected to compare the effects of FR98 and FR99 at different loading levels (80 phr and 100 phr) on the compound's curing characteristics, physical-mechanical properties, heat resistance, compression set, and flame retardancy. The data indicates significant performance differences between the two loadings.

Curing Characteristics (Rheometer): FR98 reduces the cure state (lower MH-ML) and prolongs the curing time (higher TC90) of the compound. This delaying effect and reduction in crosslink density become more pronounced as its loading increases.

Physical-Mechanical Properties: FR98 primarily reduces the tensile strength of the vulcanizate. In contrast, the vulcanizate with FR99 demonstrates higher tensile strength and better elasticity. Furthermore, FR98 causes a rapid increase in hardness and a reduction in elasticity as its loading is raised.

Flame Retardancy: Both FR98 and FR99 enable the compound to achieve a UL94 V-0 rating. FR98 yields a higher Limiting Oxygen Index (LOI). However, the FR98 vulcanizate exhibits strong intumescence (swelling) upon combustion, resulting in significant soot/ash, whereas the FR99 vulcanizate more readily forms a ceramic-like char.

Heat Air Aging Resistance: The vulcanizate with FR98 shows poor heat resistance, with greater changes in hardness, tensile strength, and elongation at break after aging compared to the FR99 vulcanizate.

Compression Set & Resilience: The vulcanizate with FR99 exhibits superior compression set resistance at high temperatures and better resilience.

In summary, based on the comprehensive data, FR99 demonstrates superior performance overall compared to FR98 within this EPDM formulation.

FR99RP vs. FR98RP Comparison – In EPDM 50 Shore A Base Formulation with Flame Retardant

# Test Data			
Rheometer Test 180℃×5min			
Test Item	Unit	FR98RP-100	FR99RP-100
Cure Curve			
ML	lbf-in	0.62	0.58
MH	lbf-in	9.02	9.89
MH-ML	lbf-in	8.4	9.31
TS2	sec	66	41
TC10	sec	53	35
TC90	sec	199	131
Conventional Physical Properties Test 175℃×6min			
Hardness (Shore A)	-	67	67
Tensile Strength	MPa	8.03	9.31
Elongation at Break	%	550	553
M100	MPa	1.75	1.85
Specific Gravity	g/cm³	1.166	1.189
Flame Retardancy Test			
Test Item	Unit	FR98RP-100	FR99RP-100
Vertical Burning (UL94 V0)	-	V-0	V-0
Oxygen Index (LOI)	%	41.5	30.5
Heat Air Aging Test 100℃×70h & Compression Set 120℃×24h			
Test Item	Unit	FR98RP-100	FR99RP-100
Hardness Change	-	/	/
Tensile Strength Change	%	/	/
Elongation at Break Change	%	/	/
Compression Set 120℃×24h			
Compression Set	%	/	/
Resilience	%	44	51

FR99RP vs. FR98RP Comparison – In EPDM 50 Shore A Base Formulation with Flame Retardant

Test Formulation 3 (EPDM 50 Shore A)	
Material Name	Basic Parts (phr)
KEP350	40
TER 4038	60
CZ500R	40
Flame Retardant (FR98 / FR99)	100
Paraffinic Oil 6030#	35
ZNO	6
STA	1.5
PEG4000	2
L-24	1
S-80	1.25
EP-33	2.5

Conclusion:
A 50-60 Shore A EPDM base formulation was used to compare FR98 and FR99 at equal loadings. Significant performance differences were observed.
Curing: FR98 reduces the cure state and prolongs curing time.
Mechanical Properties: FR99 provides higher tensile strength and better elasticity than FR98.
Flame Retardancy: Both achieve UL94 V-0, but FR98 has a higher Limiting Oxygen Index (LOI). However, FR98 causes strong intumescence and more soot, while FR99 promotes ceramic-like char formation.
Resilience: FR99 demonstrates better rebound resilience.
In summary, FR99 offers a more favorable overall performance profile in this EPDM formulation.

FR99RP vs FR98RP Comparison – In NBR 70 Shore A Base Formulation with Flame Retardant

Test Data			
Rheometer Test 180℃×5min			
Test Item	Unit	FR98RP-100	FR99RP-100
ML	lbf·in	1.03	0.7
MH	lbf·in	9.48	13.23
MH-ML	lbf·in	8.45	12.53
TS2	sec	41	38
TC10	sec	33	35
TC90	sec	79	94
Conventional Physical Properties Test 175℃×5min			
Test Item	Unit	FR98RP-100	FR99RP-100
Hardness (Shore A)	-	75	76
Tensile Strength	MPa	9.43	9.23
Elongation at Break	%	522	455
M100	MPa	2.55	2.94
Specific Gravity	g/cm³	1.28	1.312
Flame Retardancy Test			
Test Item	Unit	FR98RP-100	FR99RP-100
Vertical Burning (UL94 V0)	-	V-0	V-0
Oxygen Index (LOI)	%	37.8	32.6
Heat Air Aging Test 100℃×70h & Compression Set 120℃×24h			
Test Item	Unit	FR98RP-100	FR99RP-100
Hardness Change	-	/	/
Tensile Strength Change	%	/	/
Elongation at Break Change	%	/	/
Compression Set 120℃×24h			
Compression Set	%	/	/
Resilience	%	24	33

FR99RP vs FR98RP Comparison – In NBR 70 Shore A Base Formulation with Flame Retardant

Test Formulation 2 (NBR 70 Shore A)	
Material Name	Basic Parts, phr
NBR 3350	100
CZ500R	40
Flame Retardant	100
Plasticizer IATBC	10
ZNO	5
OSTA	1
PEG4000	1
RD	1.5
4010NA	1
L-12	1
S-80	0.75
TMTD	1.5
CZ	1.5

Conclusion:
A 70 Shore A NBR base formulation was used to compare FR98 and FR99 at equal loadings, revealing significant performance differences.
Curing Characteristics: FR98 substantially reduces the cure state of the compound while shortening the optimal cure time.
Physical Properties: The FR98 vulcanizate exhibits higher elongation at break and lower modulus, resulting in poorer elasticity.
Flame Retardancy: FR98 demonstrates superior flame retardancy, as indicated by its higher Oxygen Index and Vertical Burning rating.
Resilience: Conversely, the FR99 vulcanizate shows better rebound resilience.
In summary, FR98 offers better flame retardancy but inferior mechanical elasticity, whereas FR99 provides a valuable balance of physical properties and resilience.

FR Series Flame Retardants: Defining the Future of Halogen-Free Flame Retardants through Super-Refinement, Activation, Functionalization, and Compounding.

GreenThink ® FR Series - High-Efficiency Composite Flame Retardant – Mature EPDM formulations containing this flame retardant have passed UL certification.

Sanexin Polymer is an innovative company specializing in the R&D and production of new materials. After years of research and development by a team of experts, we have successfully created the **GreenThink ® FR Series** of high-efficiency composite flame retardants.

Flame Retardant Mechanism of GreenThink ® FR:
Upon heating, the **GreenThink ® FR Series** decomposes and expands on the product surface, forming a viscous, charred crust and a porous, insulating layer. This barrier isolates the diffusion of oxygen, heat, and small molecules during combustion. Furthermore, the decomposition generates free radicals that react with the H· and OH· radicals which propagate combustion, thereby terminating the chain reaction. Simultaneously, it releases water and carbon dioxide and efficiently absorbs a significant amount of the generated heat, suppressing flames and achieving highly efficient flame retardation.

GreenThink ® FR Series: This series is free from halogen-based flame retardants such as polybrominated biphenyls (PBBs), polybrominated diphenyl ethers (PBDEs), chlorine, fluorine, and antimony trioxide. It features **high flame retardant efficiency, low smoke emission, low toxicity, and halogen-free** properties, complying with EU environmental directives like Reach/RoHS and WEEE.

Compared to currently available products of similar purpose, the GreenThink ® FR Series offers superior flame retardant efficiency, excellent physical properties, relatively low density, and convenient processing and molding. It belongs to the category of **halogen-free, high-efficiency, environmentally friendly synergistic flame retardants.**

It is widely used in flame-retardant rubber and plastics, as well as other flame-retardant products, across industries including **cables, rail transit components, electronic and electrical parts, automotive, and petroleum and coal mining.**

FR Series Flame Retardants: Defining the Future of Halogen-Free Flame Retardants through Super-Refinement, Activation, Functionalization, and Compounding.

Excellent performance in rubber:

1.Highly efficient synergistic flame retardancy, easily achieves V-0 rating.

2.Halogen-free, complies with increasing environmental requirements.

3.Meets EU Reach/RoHS, WEEE environmental directives.

4.Smooth extrusion products.

5.Relatively low product density.

Good performance in compound processing:

1.Good dispersibility in the compound.

2.Good fluidity of the compound, easy extrusion with excellent dimensional stability.

3.Lower energy consumption during mixing.

4.Shortens the optimum cure time.

Main characteristics:

1.Platelet structure and surface treatment.

2.Large specific surface area.

3.Small particle size and reasonable particle size distribution.

4.Low impurity content, non-toxic, odorless.

5.Excellent chemical stability.

GreenThinking®FR95/96RP -高效复合阻燃剂 – 符合 REACH、Rohs认证

Test Report

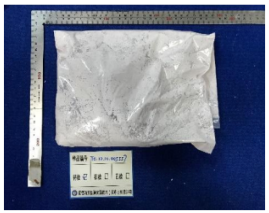
Report No. TC.22.10.005557

Date of Issue 10/17/2022

Applicant: Shanghai Powerflex New Material Co., Ltd

Applicant address: Room 1606-1608, Boda Commercial Buildings, No.11 Puhuitang Road. Xuhui District, Shanghai, China

Description of the test subject:

Sample	Description	Photo
001	Sample Description: Functional filler FR35RP Style No.: FR35RP,FR21RP,FR97RP,FR76RP, FR10RP,FR95RP,FR96RP,FR50RP, FR56RP,PF81,PF82,PF92, PF82,PF41,PF86,PF85,SF210, SF310,SF215,SF216,RS903,RS905, RS906,RS916,RS920,RS925,AG60, AG40,FB05,FB10,FB20,FB35,FB45, FB60,WL820,WL720	

Receipt Date of Sample: 10/11/2022

Date of Testing: From 10/11/2022 to 10/17/2022

Sample Submitted: The sample(s) was (were) submitted by applicant and identified.

Conclusion:

Test Items			Conclusion
No.	Items	Standard	
1	224 SVHC in candidate list	Regulation (EC) No 1907/2006 (REACH Act)	Pass

Test Report

Report No. TC.22.10.005556

Date of Issue 10/17/2022

Applicant: Shanghai Powerflex New Material Co., Ltd

Applicant address: Room 1606-1608, Boda Commercial Buildings, No.11 Puhuitang Road. Xuhui District, Shanghai, China

Description of the test subject:

Sample	Description	Photo
001	Sample Description: Functional filler FR35RP Style No.: FR35RP,FR21RP,FR97RP,FR76RP, FR10RP,FR95RP,FR96RP,FR50RP, FR56RP,PF81,PF82,PF92, PF82,PF41,PF86,PF85,SF210, SF310,SF215,SF216,RS903,RS905, RS906,RS916,RS920,RS925,AG60, AG40,FB05,FB10,FB20,FB35,FB45, FB60,WL820,WL720	

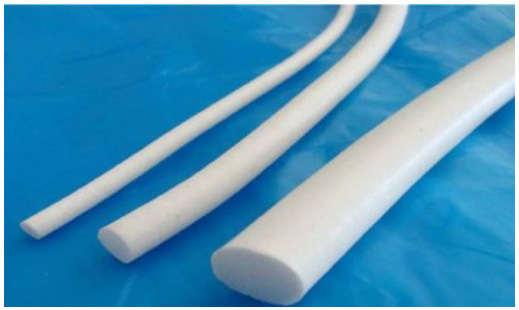
Receipt Date of Sample: 10/11/2022

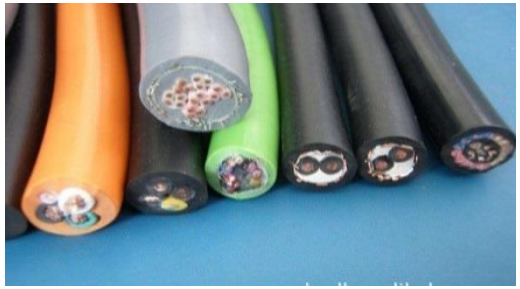
Date of Testing: From 10/11/2022 to 10/17/2022

Sample Submitted: The sample(s) was (were) submitted by applicant and identified.

Conclusion:

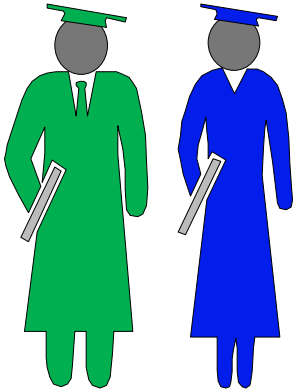
Test Items				Conclusion
No.	Items	Test Standard	Evaluation Standard	
1	ROHS 2.0	IEC 62321-5:2013 IEC 62321-4:2013+AMD1:2017 IEC 62321-7-2:2017 IEC 62321-6:2015 IEC 62321-8:2017	RoHS Directive 2011/65/EU (RoHS 2.0) and its subsequent amendments Directive (EU) 2015/863	Pass



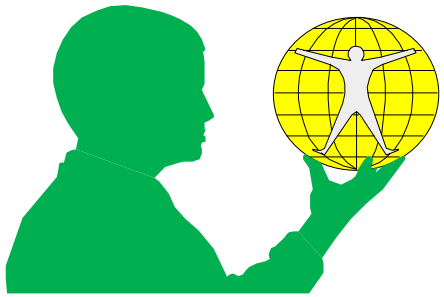


The development trend of flame retardants： Environmental protection, low toxicity, high efficiency, multi-functional

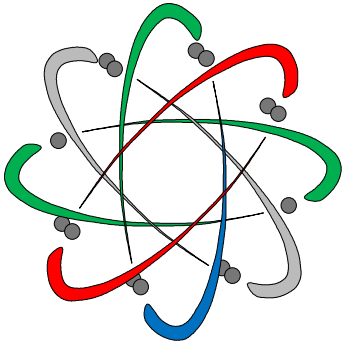
Powerflex： Leading halogen-free flame retardants: ultra-fine, active, functional and compound



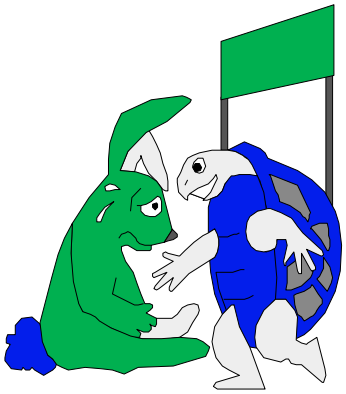
Flame retardant research



Flame retardant application



Laws and regulations



Flame retardant cooperation