

Fluon+ Modifiers Product Information

Draft

Description

This product information focuses on modification of Engineering plastics with AGC special fluoropolymers. This technology improves flexibility, wear resistance, impact resistance, electrical properties and water absorption for various Engineering plastics like Polyamide (PA), PolyArylEtherKetone (PAEK), Polyphenylene Sulfide (PPS) by fluoropolymer additives. Especially, modified polyamide (PA) with the fluoropolymer additive the tensile strength and elongation will be maintained. Modified Engineering plastics can be processed/molded the same as original engineering plastics. Promising applications are Wire & Cable insulation, Tubing, Hose, Film, Injection molded parts, machined parts and and more. We can also supply various modified engineering plastics incorporating our unique fluoropolymers.

Sample	Pellet	Powder	Film
Modified engineering plastic (*)	Yes	No	No
Fluoropolymer modifier	Yes	Yes	Yes

* R&D samples are available for evaluation upon request

Selection of Engineering Plastics to Apply the Modification Technology

Various engineering plastics can be improved, especially for impact resistance.

Modified engineering plastics (*)	Improvement of physical properties against non-modified resin				
	Impact strength	Tensile strength	Flexural strength	Abrasion resistance	Water absorption resistance
Modified-PPS	Improved	Decreased	Decreased	-	-
Modified-PEI	Improved	Decreased	Decreased	-	-
Modified-PA46	Improved	-	Decreased	-	Improved
Modified-PA66	Improved	No change	Decreased	-	Improved
Modified-PAMXD6	Improved	Decreased	Decreased	-	Improved
Modified-PA6	Improved	No change	No change	Improved	Improved
Modified-PA12	Improved	No change	No change	-	Improved
Modified-PEEK	Improved	Decreased	Decreased	Improved	-

* R&D samples

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Material Features and Basic Physical Properties of Modified PA6 and PA66

Modified PA6, Modified PA66 shows the following extraordinary physical properties with our fluoropolymer technology:

- Excellent impact resistance and flexibility
- Excellent water absorption reduction
- Excellent wear resistance

Polyamide	Test	Unit	Measurement	Improvement of Physical properties		
				PA6	Modified PA6-1 (R&D sample)	Modified PA6-2 (R&D sample)
PA6	Impact strength under 23 degC	J/m	ASTM D-256 (conformity)	45	94	144
	Impact strength under -40 degC	J/m	ASTM D-256 (conformity)	27	49	66
	Flexural modulus	GPa	ASTM D-790	2.7	2.5	2.2
	Flexural strength	MPa	ASTM D-790	104	101	89
	Tensile strength	MPa	ASTM D-638	86	78	79
	Tensile elongation	%	ASTM D-638	333	308	345
	Abrasion loss	cm ³	JIS K-7218	5E-03	1E-03	1E-03
	Dynamic friction coefficient	∅	JIS K7218	0.56	0.57	0.59
	Water absorption	Wt%	23degC 24h 100% water	3.9	3.2	2.8

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Polyamide	Test	Unit	Measurement	Improvement of Physical properties		
				PA66	Modified PA66-1 (R&D sample)	Modified PA66-2 (R&D sample)
PA66	Impact strength under 23 degC	J/m	ASTM D-256 (conformity)	34	49	83
	Impact strength under -40 degC	J/m	ASTM D-256 (conformity)	31	44	52
	Flexural modulus	GPa	ASTM D-790	3.4	2.9	2.5
	Flexural strength	MPa	ASTM D-790	130	113	98
	Tensile strength	MPa	ASTM D-638	75	79	69
	Tensile elongation	%	ASTM D-638	31	39	39

Modified PA Electrical Property Data

PA66, PA12 and PA9T modification with special fluoropolymers can improve electrical property.

Test	Measurement		Improvement of Physical properties (*R&D Samples)								
			PA66	Modified PA66-1	Modified PA66-2*	PA12	Modified PA12-1*	Modified PA12-2*	PA9T	Modified PA9T-1*	Modified PA9T-2*
Dielectric constant under 23degC, 1MHz	ASTM D-150	23degC, 1MHz	3.31	3.26	3.06	2.97	2.94	2.86	3.10	3.00	2.90
Dielectric loss tangent under 23degC, 1MHz			0.020	0.019	0.017	0.041	0.036	0.029	0.017	0.015	0.013

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Material Features and Physical Properties of Modified PEEK

Modified PEEK's extraordinary physical properties with our fluoropolymer technology:

- Excellent impact resistance and flexibility
- Excellent wear resistance
- Excellent electrical property

PAEK	Test			Unit	Measurement	Modified PEEK containing our developed product		Standard
						KB-2220	KB-2230	PEEK
PEEK	Impact strength under 23 degC			J/m	ASTM D-256 (conformity)	40	42	32
	Impact strength under -40 degC			J/m	ASTM D-256 (conformity)	29	28	11
	Flexural modulus			GPa	ASTM D-790	2.7	2.0	3.9
	Wear coefficient			cm ³	JIS K-7218	1.5E-03	7.2E-05	4.7E-02
	Dynamic friction coefficient				JIS K7218	0.5	0.4	0.5
	Tensile strength			MPa	ASTM D-638	62	47	99
	Tensile elongation			%	ASTM D-638	26	25	31
	Melting point			°C	DSC	342	343	344
	Dielectric constant	23 °C	60Hz		ASTM D-150	3.4	3.4	3.5
		200 °C	60Hz			3.7	3.6	4.2
			1KHz			3.6	3.5	3.9
			1MHz			3.4	3.3	3.6
	dielectric loss tangent	23 °C	60Hz		ASTM D-150	9.00E-03	1.00E-02	1.00E-03
		200 °C	60Hz			7.00E-02	6.00E-02	2.00E-01
			1KHz			2.00E-02	1.00E-02	4.00E-02
			1MHz			2.00E-02	2.00E-02	3.00E-02

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Properties of Fluoropolymer Modifiers Are Key to Best Performance

AGC can provide a wide variety of fluoropolymer modifiers suitable for modification of Engineering plastics. The key to establish the best material performance depends on the proper fluoropolymers selection coupled with the kinds of Engineering plastic matrix resin, as well as their applications.

Property	Unit	JBB-0001 (semi-commercial)	IP-20E (R&D sample)	Fluon adhesive EA2000 PW-50 (semi-commercial)	Fluon adhesive EA2000 PW10 (semi-commercial)
Melt flow rate	g/10min	4 (250C 21.2N)	20 (297C 49N)	16 (297C 49N)	16 (297C 49N)
Specific gravity		1.75	1.76	2.13	2.13
Melting point	°C	183	243	300	300
D50 Particle size	um	20-50	20-70	20-50	2-3

Safe Handling Information

A summary of the hazards, as defined by OSHA Hazard Communication Standard, 29 CFR 1910.1200 for this product are:

Physical hazards: None

Health hazards: None

FOR ADDITIONAL INFORMATION AND HANDLING INSTRUCTIONS READ AGC CHEMICALS AMERICAS, INC. MATERIAL SAFETY DATA SHEET.

Handling and Storage

Heating Fluon® products in excess of 750°F (399°C) can produce toxic fumes. It is, therefore, necessary to provide local exhaust ventilation in areas where Fluon® products are exposed to high temperatures. Avoid breathing fumes or contaminating smoking tobacco with fumes, powder, or dust.

Thermal decomposition of this product will generate hydrogen fluoride, which is corrosive. Corrosion resistance materials are required for prolonged contact with molten resin.

Fluon+ mPLASTICS products should be stored in their original containers. This will be either in re-sealable plastic pails, or in drums with the liner bags and chime rings securely re-fastened.



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Products should be stored indoors at nominal conditions of 23 C and 50% relative humidity. Products should be dried prior to use.

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