



AFLAS[®] applications

Oil & Gas Applications

DESCRIPTION

AFLAS[®] Fluoroelastomers are copolymers of tetrafluoroethylene and propylene. This combination gives AFLAS Fluoroelastomers unique properties over conventional FKM-type fluoroelastomers in demanding applications. AFLAS Fluoroelastomers display outstanding resistance to heat, acids & bases, many solvents, ozone, and steam. Classified by ASTM D 1418-01 as FEPM.

MATERIAL FEATURES

- **Heat Resistance*:** Mechanical properties of AFLAS do not deteriorate even when used for prolonged exposure to 200°C (392°F). AFLAS can be used continuously for 2 to 3 months at 230°C (446°F) and for 10-30 days at 260°C (500°F).
- **Chemical Resistance:** Parts fabricated from AFLAS compounds perform well in the amine and base-rich environments commonly found in sour oil and gas exploration, completion and production. In automotive and heavy equipment applications, AFLAS stands up well to attack from amine-containing additives in oils and transmission fluids.
- **Steam Resistance*:** Unaffected by extended exposure to 200°C steam.
- **H₂S gas Resistance:** Outstanding chemical resistance to H₂S gas.
- **Fluids Resistance:** Excellent resistance to chemical attack by various types of fluids.

*Part size and design may vary results.

END USER BENEFITS

- Long service use (> 25 years) in harsh environments
- Can be compounded to be highly resistant to rapid gas decompression (e.g. NORSOK)
- Preferred material for high pressure and high temperature (HPHT) conditions.
- Excellent chemical durability to oil exploration and production fluids.

TYPICAL APPLICATIONS

- O-rings,
- Gaskets & seals
- Packer elements
- Pump covers
- Sensor parts
- Oilfield cables
- Pump stator
- And more...

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AGC

AGC Chemicals Americas, Inc.
Business & Technical Center
55 E. Uwchlan Ave, Suite 201
Exton, PA 19341

Phone: 610.423.4300

Fax: 610.423.4301

<http://www.agcchem.com>



PERFORMANCE COMPARISON

	AFLAS	FKM	HNBR	EPDM
Service Temperature	392°F	392°F	302°F	302°F
H ₂ S	1	1	4	1
CO ₂	1	1	1	1
Amines	1	4	3	4
Steam	1	3	4	1
Formates	1	4	2	1
Alcohols	1	2	1	1
Acids	1	1	3	4

1 = EXCELLENT 2 = GOOD 3 = APPLICABLE 4 = NOT RECOMMENDED

AFLAS GRADES SUITABLE FOR OIL & GAS INDUSTRY

AFLAS 100H is well suited for products to be used in extremely severe, high-temperature, high-pressure environments such as oil-drilling fields because of extremely high molecular weight and outstanding heat and chemical resistance, AFLAS 100H retains high elongation properties in spite of its high hardness formulation.

AFLAS 100S is widely used in various products such as durable packers, bladders, gaskets, and O-rings. Its key properties for this range of applications are outstanding performance in compression set, high strength, and excellent H₂S gas resistance.

AFLAS 150P is well suited for extruded parts like wire insulation and cable jacketing, and transfer molded parts like sensor parts because of better processability due to its low viscosity (low mooney value).

Grade	Storage shear modulus G'	Appearance	Features
100H	450-545	Brown	High Elongation, High Hardness
100S	290-390	Brown	High Strength, Better Compression Set
150P	205-275	Brown	Lower Mooney, Better Processability

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AFLAS FORMULATION FOR HIGHER HARDNESS

The formulation for high hardness is required for oil & gas field applications. AFLAS 100H is suitable for high hardness parts with better elongation. These are examples of high-hardness formulations.

		Standard formulation	Example 1	Example 2	Example 3
Formulation	AFLAS 100H	100	100	100	100
	MT carbon (N990)	30	15		
	SRF carbon (N770)			20	10
	FEF carbon (N550)		15	20	10
	MAF carbon (N550)			18	
	Fumed Silica R-8200				20
	TAIC *	5	5	5	5
	Peroxide**	1		1	1
	Sodium stearate	1			
Calcium stearate		1	1	1	
Viscosity	Mooney viscosity of full compound				
	ML1+4 (121°C)	122	Not measurable	Not measurable	Not measurable
	ML1+10 (121°C)	114	Not measurable	Not measurable	Not measurable
Steady state physical property	Tensile strength [MPa]	21	22	24	23
	100% modulus [MPa]	6	8	21	10
	Tensile elongation [%]	300	260	120	240
	Hardness [Shore-A]	72	76	91	90
	Specific gravity	1.59	1.58	1.62	1.61
	Compression set★ [%]	35	38	46	37

Note) Curing conditions: Compression cure at 170°C x 20 min + post cure at 200°C x 4 hours;

★ 25% compression at 200°C x 70 hours. Large test pieces were used (according to JIS K-6262).

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AFLAS 100H CURE CONDITION FOR HIGH HARDNESS

AFLAS 100H retains high elongation properties even in high-hardness formulations with hardness of more than 90 Shore A, because of its extremely high molecular weight and outstanding heat and chemical resistance. High-hardness formulations with AFLAS 100H also provide some of the highest tensile strength values in this class of fluoroelastomers. At the same time, the very high Mooney viscosity of AFLAS 100H in high-hardness formulations requires ingenuity when using the fluoroelastomer for molding. Take due care when molding large or thick articles, as more time will be required for thermal conduction. Go through the following checkpoints whenever molding large and thick articles with high-hardness formulations.

Checkpoints for molding

➤ **Pre-heat a full compound:**

Pre-heating of a full compound at an upper limit of about 100°C ensures relatively low viscosity at the start of compression and smoother flow of the material into the mold. Pre-heating also accelerates curing inside and reduces uneven curing.

➤ **Reduce compression speed:**

Because of its low fluidity, the material flows easily into the mold when slow compression is applied. When molding under this condition, remember to set the temperature relatively low to prevent scorching.

➤ **Increase the temperature gradually:**

A step-by-step temperature increase will eliminate curing inconsistencies between the outer surface of the article and the inside portions. The same holds true for the post cure.

If at any time you have questions or concerns about a specific application, please contact your account manager for assistance.

NOTE: The data listed here represents typical values for the stated grades of AFLAS[®] fluoroelastomers. This information should be used as a guide only and not to establish specification limits or design criteria. AGC Chemicals Americas assumes no obligation or liability for any advice furnished by us or for results obtained with respect to this product. All such advice is provided free of charge and the buyer assumes sole responsibility for results obtained in reliance thereon.

For more information and samples contact

AGC Chemicals Americas, Inc.
55 E. Uwchlan Avenue, Suite 201
Exton, PA 19341

Phone: (800) 424-7833

Fax: (610) 423-4301

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