

DESCRIPTION

TITLE OF INVENTION

Perfluoroelastomer Composition and Sealing Material

5 TECHNICAL FIELD

The present invention relates to a perfluoroelastomer composition and a sealing material including the same.

BACKGROUND ART

10 Sealing materials (gaskets, packings, and the like) are used for various applications, and characteristics according to the applications are required. For example, when sealing materials are used under a high-temperature environment, they are required for heat resistance. When sealing materials are used under an environment in which the sealing materials are exposed to a plasma, they are required for resistance to the plasma (plasma resistance).

15 Meanwhile, ozone having strong oxidizing power may be used in a film forming process in producing a semiconductor device or a flat panel display. Sealing materials used in a manufacturing device using ozone are required for resistance to ozone (ozone resistance).

PTLs 1 to 3 focus attention on ozone resistance of a sealing material.

20 CITATION LIST

PATENT LITERATURE

PTL 1: Japanese Patent Laying-Open No. 08-151450

PTL 2: Japanese Patent Laying-Open No. 2004-263038

PTL 3: Japanese Patent Laying-Open No. 2010-037558

25 SUMMARY OF INVENTION

TECHNICAL PROBLEM

The techniques described in PTLs 1 to 3 have room for improvement at least in the following points.

(1) PTL 1: Ozone resistance under a high-temperature environment is

insufficient. In a fluoro-rubber molded article described in PTL 1, a filler such as an inorganic filler or the like is preferably blended from the viewpoint of reducing the blending amount of rubber while favorably maintaining ozone resistance or the like. However, the inorganic filler may cause contamination of a device to which a sealing material is applied or a product produced by using the device. That is, even when a sealing material having good ozone resistance is used, an elastomer component of the sealing material may be etched by ozone under a severe ozone environment. In this case, the inorganic filler to be blended may be scattered in the device.

(2) PTL 2: A fluoro-rubber molded article including a tetrafluoroethylene-propylene-based copolymer is disclosed. However, the tetrafluoroethylene-propylene-based copolymer contains a C-H bond in a polymer skeleton, so that it has poorer ozone resistance than that of a perfluoroelastomer.

(3) PTL 3: A fluorine-containing elastomer composition containing a specific crosslinking agent is disclosed. However, it is generally difficult to obtain the crosslinking agent.

Meanwhile, the sealing material used under a high-temperature environment is required to have excellent compression set characteristics under a high temperature environment (an index of a lifetime when used under a high-temperature environment).

An object of the present invention is to provide a perfluoroelastomer composition capable of being prepared by using commonly available raw materials and capable of forming a crosslinked product exhibiting good ozone resistance and/or compression set characteristics under a high-temperature environment even when an inorganic filler is not blended, and a sealing material including the same.

SOLUTION TO PROBLEM

The present invention provides a perfluoroelastomer composition and a sealing material shown below.

- [1] A perfluoroelastomer composition comprising:
a perfluoroelastomer;
a peroxide crosslinking agent;

a co-crosslinking agent that is a diolefin compound; and
an organic pigment.

[2] The perfluoroelastomer composition according to [1], wherein a content of
the organic pigment is greater than or equal to 0.05 parts by weight and less than 2
5 parts by weight with respect to 100 parts by weight of the perfluoroelastomer.

[3] The perfluoroelastomer composition according to [1] or [2], wherein the
perfluoroelastomer does not contain an inorganic filler.

[4] A sealing material comprising a crosslinked product of the
perfluoroelastomer composition according to any one of [1] to [3].

10 ADVANTAGEOUS EFFECT OF INVENTION

The present invention can provide a perfluoroelastomer composition capable of
forming a crosslinked product exhibiting good ozone resistance and/or compression set
characteristics under a high-temperature environment even when an inorganic filler is
not blended, and a sealing material including the perfluoroelastomer.

15 DESCRIPTION OF EMBODIMENTS

<Perfluoroelastomer composition>

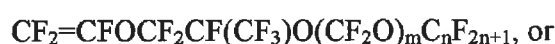
[a] Perfluoroelastomer

A perfluoroelastomer is not particularly limited, and examples thereof include a
tetrafluoroethylene (TFE)-perfluoro (alkyl vinyl ether)-based copolymer and a TFE-
20 perfluoro (alkoxyalkyl vinyl ether)-based copolymer. These copolymers may further
contain a constituent unit derived from another perfluoromonomer. A
perfluoroelastomer composition containing the perfluoroelastomer can have higher
ozone resistance and/or compression set characteristics than those of a composition
containing a hydrogen atom-containing fluoroelastomer. The perfluoroelastomer
25 composition may contain only one or two or more of the perfluoroelastomers.

A perfluoro (alkyl vinyl ether) forming the tetrafluoroethylene (TFE)-perfluoro
(alkyl vinyl ether)-based copolymer can have an alkyl group having 1 to 5 carbon
atoms, and example thereof include perfluoro (methyl vinyl ether), perfluoro (ethyl
vinyl ether), and perfluoro (propyl vinyl ether). Perfluoro (methyl vinyl ether) is

preferable.

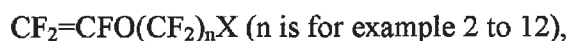
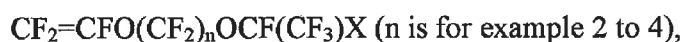
A perfluoro (alkoxyalkyl vinyl ether) forming the TFE-perfluoro (alkoxyalkyl vinyl ether)-based copolymer can have a group that is bonded to a vinyl ether group ($\text{CF}_2=\text{CFO}-$) and that has 3 to 12 carbon atoms, and examples thereof include:



$\text{CF}_2=\text{CFO}(\text{CF}_2)_2\text{OC}_n\text{F}_{2n+1}.$ In the formula, n is for example 1 to 5, and m is for example 1 to 3.

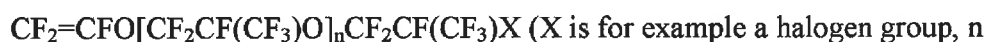
10 The perfluoroelastomer has a crosslinking property. The crosslinking property can be imparted by further copolymerizing a crosslinking site monomer (further containing a constituent unit derived from a crosslinking site monomer). The crosslinking site means a site capable of being crosslinked. Examples of the crosslinking site include halogen groups (for example, an I group, a Br group, and the like), and the crosslinking site is preferably an I group. The perfluoroelastomer
15 having a halogen group as the crosslinking site can be crosslinked by a peroxide crosslinking system using a peroxide crosslinking agent, whereby a crosslinked product having good ozone resistance and/or compression set characteristics under a high-temperature environment can be obtained.

20 An example of the crosslinking site monomer having a halogen group as the crosslinking site is a halogen group-containing perfluorovinyl ether. Examples of the halogen group-containing perfluorovinyl ether include:



25 $\text{CF}_2=\text{CFO}[\text{CF}_2\text{CF}(\text{CF}_3)\text{O}]_m(\text{CF}_2)_n\text{X}$ (X is a halogen group, n is for example 2, and m is for example 1 to 5),

$\text{CF}_2=\text{CFO}[\text{CF}_2\text{CF}(\text{CF}_3)\text{O}]_m(\text{CF}_2)_n\text{X}$ (X is a halogen group, n is for example 1 to 4, m is for example 1 to 2), and



is for example 0 to 4).

A crosslinkable perfluoroelastomer may have a crosslinking structure crosslinking two main chains.

5 The molar ratio of the constituent unit derived from TFE in the perfluoroelastomer/the constituent unit derived from the perfluoro (alkyl vinyl ether) or the perfluoro (alkoxyalkyl vinyl ether)/the constituent unit derived from the crosslinking site monomer is usually 50 to 74.8%/25 to 49.8%/0.2 to 5%, and preferably 60 to 74.8%/25 to 39.5%/0.5 to 2%. The perfluoroelastomer composition of the present invention may contain two or more perfluoroelastomers having different
10 ratios of the constitutional units.

[b] Organic pigment

The perfluoroelastomer composition contains an organic pigment. Thus, a crosslinked product crosslinked by a peroxide crosslinking system together with a co-crosslinking agent that is a diolefin compound can be improved in ozone resistance
15 under a high-temperature environment and/or compression set characteristics under a high-temperature environment (particularly higher than or equal to 250°C). In general, the crosslinked product crosslinked by the peroxide crosslinking system tends to have poorer compression set characteristics under a high-temperature environment than those of a crosslinked product crosslinked by an oxazole crosslinking system or a
20 triazine crosslinking system. However, the perfluoroelastomer composition of the present invention containing the organic pigment can significantly improve the compression set characteristics of the crosslinked product crosslinked by the peroxide crosslinking system under a high-temperature environment.

Specific examples of the organic pigment usable in the present invention
25 include azo pigments (such as azo lake pigments, insoluble azo pigments, and condensed azo pigments); polycyclic pigments such as anthraquinone-based pigments, thioindigo-based pigments, perinone-based pigments, perylene-based pigments, quinacridone-based pigments, isoindolinone pigments, isoindoline pigments, dioxazine pigments, quinophthalone pigments, and diketopyrrolopyrrole pigments, and

phthalocyanine-based pigments. The perfluoroelastomer composition may contain only one organic pigment, or may contain two or more of the organic pigments. As the organic pigment, an organic pigment classified as a pigment in color index can be used.

5 The organic pigment preferably used is an organic pigment containing no metal element. There is no possibility that the organic pigment containing no metal element scatters a substance derived from a metal element even if the sealing material is used under a severe ozone environment such as a semiconductor application, and the sealing material is etched.

10 From the viewpoint of effectively improving ozone resistance under a high-temperature environment and/or compression set characteristics under a high-temperature environment, the content of the organic pigment (the total amount when two or more thereof are used) in the perfluoroelastomer composition is preferably greater than or equal to 0.05 parts by weight and less than 2 parts by weight, more
15 preferably greater than or equal to 0.05 parts by weight and less than or equal to 1.8 parts by weight, still more preferably greater than or equal to 0.05 parts by weight and less than or equal to 1.5 parts by weight, and yet still more preferably greater than or equal to 0.05 parts by weight and less than or equal to 1.3 parts by weight (for example, greater than or equal to 0.05 parts by weight and less than or equal to 1.1 parts by
20 weight), with respect to 100 parts by weight of the perfluoroelastomer.

[c] Crosslinking agent and co-crosslinking agent

 The perfluoroelastomer composition contains a peroxide crosslinking agent. Only one of peroxide crosslinking agent may be used, or two or more of the peroxide crosslinking agents may be used in combination. The peroxide crosslinking agent
25 may be, for example, 2,5-dimethyl-2,5-di(t-butylperoxy)hexane (commercially available example: "Perhexa 25B" manufactured by NOF Corporation); dicumyl peroxide (commercially available example: "Percumyl D" manufactured by NOF Corporation); 2,4-dichlorobenzoyl peroxide; di-t-butyl peroxide; t-butyl dicumyl peroxide; benzoyl peroxide (commercially available example: "Nyper B" manufactured

by NOF Corporation); 2,5-dimethyl-2,5-(t-butylperoxy)hexyne-3 (commercially available example: "Perhexin 25B" manufactured by NOF Corporation); 2,5-dimethyl-2,5-di(benzoylperoxy)hexane; α,α' -bis(t-butylperoxy-m-isopropyl)benzene (commercially available example: "Perbutyl P" manufactured by NOF Corporation); t-
5 butyl peroxyisopropyl carbonate; parachlorobenzoyl peroxide, or the like.

In the peroxide crosslinking system, a co-crosslinking agent is used together with the peroxide crosslinking agent. In the present invention, as at least part of the co-crosslinking agent, a diolefin compound is used, which is represented by the following formula (1):



n in the formula (1) is preferably an integer of 4 to 12, and more preferably an integer of 4 to 8. The present invention uses the peroxide crosslinking system including the diolefin compound, so that the ozone resistance of the crosslinked product under a high-temperature environment and/or the compression set characteristics of the
15 crosslinked product under a high-temperature environment (particularly higher than or equal to 250°C) can be significantly improved as compared with other peroxide crosslinking systems. Only one diolefin compound represented by the formula (1) may be used, or two or more of the diolefin compounds may be used in combination.

The co-crosslinking agent may contain a co-crosslinking agent other than the
20 diolefin compound. Other examples of the co-crosslinking agent include compounds capable of being co-crosslinked by radicals such as triallyl isocyanurate (commercially available example: "TAIC" manufactured by Nihon Kasei Co., Ltd.); triallyl cyanurate; triallyl formal; triallyl trimellitate; N,N'-m-phenylene bismaleimide; dipropargyl terephthalate; diallyl phthalate; and tetraallyl terephthalamide (unsaturated
25 polyfunctional compounds). Only one co-crosslinking agent may be used, or two or more of the co-crosslinking agents may be used in combination.

The content of the peroxide crosslinking agent (the total amount when two or more thereof are used) in the perfluoroelastomer composition is, for example, 0.01 to 20 parts by weight with respect to 100 parts by weight of the perfluoroelastomer, and

from the viewpoint of improving the ozone resistance and/or the compression set characteristics under a high-temperature environment, the content is preferably 0.1 to 10 parts by weight, and more preferably 0.5 to 5 parts by weight

5 The content of the co-crosslinking agent (the total amount when two or more thereof are used) in the perfluoroelastomer composition is, for example, 0.1 to 40 parts by weight with respect to 100 parts by weight of the perfluoroelastomer, and from the viewpoint of improving the ozone resistance and/or the compression set characteristics under a high-temperature environment, the content is preferably 0.2 to 10 parts by weight.

10 [d] Other blending agents

For the purpose of improving processability and controlling physical properties, the perfluoroelastomer composition can contain additives such as an anti-aging agent, an antioxidant agent, a vulcanization accelerator, a processing aid (stearic acid or the like), a stabilizer, a tackifier, a silane coupling agent, a plasticizer, a flame retardant
15 agent, a mold release agent, a wax, and a lubricant, if necessary. Another example of the additives is a tackiness reducing (preventing) agent such as a fluorine-based oil (for example, perfluoroether or the like). Only one additive may be used, or two or more of the additives may be used in combination.

However, volatilization, elution, or deposition may occur when the sealing
20 material is used in a high-temperature environment, and therefore, the amount of the additive is as small as possible (for example, less than or equal to 10 parts by weight, preferably less than or equal to 5 parts by weight, more preferably less than or equal to 2 parts by weight, and still more preferably less than or equal to 1 part by weight, with respect to 100 parts by weight of the perfluoroelastomer), and it is desirable that no
25 additive is contained.

The perfluoroelastomer composition may contain inorganic fillers such as carbon black, silica, alumina, zinc oxide, titanium oxide, clay, talc, diatomaceous earth, barium sulfate, calcium carbonate, magnesium carbonate, calcium oxide, mica, graphite, aluminum hydroxide, aluminum silicate, hydrotalcite, a metal powder, a glass powder,

and a ceramic powder, if necessary.

However, the inorganic filler may be scattered under a severe ozone environment as described above, and therefore, the amount of the inorganic filler is preferably as small as possible (for example, less than or equal to 10 parts by weight, preferably less than or equal to 5 parts by weight, more preferably less than or equal to 2 parts by weight, and still more preferably less than or equal to 1 part by weight, with respect to 100 parts by weight of the perfluoroelastomer), and it is desirable that no inorganic filler is blended. The inorganic filler refers to a filler containing a metal element (Ba, Ti, Zn, Al, Mg, Ca, Si or the like).

The perfluoroelastomer composition may further contain a fluororesin. Thus, the ozone resistance and mechanical strength of the crosslinked product of the perfluoroelastomer composition can be further improved. The form of the fluororesin is not particularly limited, but the fluororesin can be contained as fluororesin particles, for example, in the perfluoroelastomer composition.

The fluororesin is a resin having a fluorine atom in the molecule thereof. Examples of the fluororesin include polytetrafluoroethylene (PTFE), a tetrafluoroethylene-perfluoroalkyl vinyl ether copolymer (PFA), a tetrafluoroethylene-hexafluoropropylene copolymer (FEP), a tetrafluoroethylene-ethylene copolymer (ETFE), polychlorotrifluoroethylene (PCTFE), a chlorotrifluoroethylene-ethylene copolymer (ECTFE), polyvinylidene fluoride (PVDF), polyvinyl fluoride (PVF), a vinylidene fluoride-hexafluoropropylene copolymer (a VDF-HFP copolymer), and a vinylidene fluoride-hexafluoropropylene-tetrafluoroethylene copolymer (a VDF-HFP-TFE copolymer). Only one fluororesin may be used, or two or more of the fluororesins may be used in combination.

Among the above-mentioned compounds, from the viewpoint of preventing the impairment of characteristics such as compression set caused by the melting of the resin under a high-temperature environment, fluororesins having a relatively high melting point such as PFA and PTFE are preferably used.

The fluororesin may contain a functional group. The functional group can be

introduced, for example, by copolymerizing a monomer having the functional group. When the aforementioned crosslinking site monomer is copolymerized as the monomer having a functional group, the crosslinking agent also causes the crosslinking of the fluororesin and the perfluoroelastomer to proceed, so that the mechanical strength or the like of the crosslinked product of the perfluoroelastomer composition can be further improved. Examples of the fluororesin having a functional group include nitrile group-containing polytetrafluoroethylene described in Japanese Patent Laying-Open No. 2013-177631.

10 The fluororesin may also be a modified fluororesin such as “TFM modified PTFE” (manufactured by Dyneon).

When the fluororesin is used, the content of the fluororesin in the perfluoroelastomer composition (the total amount when two or more of the fluororesins are used) is preferably 1 to 100 parts by weight, and more preferably 5 to 50 parts by weight, with respect to 100 parts by weight of the perfluoroelastomer, from the viewpoint of effectively improving the mechanical strength or the like of the crosslinked product. When the content of the fluororesin is excessively large, the content of the perfluoroelastomer exhibiting elasticity is relatively decreased, which causes deteriorated compression set characteristics.

[e] Preparation of perfluoroelastomer composition

20 The perfluoroelastomer composition can be prepared by uniformly kneading a perfluoroelastomer, an organic pigment, a crosslinking agent, a co-crosslinking agent, and other blending agents added as necessary. As a kneading machine, for example, conventionally known kneading machines such as mixing rollers (such as an open roll) and mixers (such as a kneader and a Banbury mixer) can be used. These blending agents may be mixed and kneaded in one step. Alternatively, all these blending agents may be kneaded in several steps in such a manner that some of the blending agents are kneaded and subsequently the remainders of the blending agents are kneaded.

As for the kneading of the perfluoroelastomer with the fluororesin, for example, the following methods can be used: 1) a method in which a powder of the

perfluoroelastomer is kneaded with a powder of the fluoro-resin with a mixing roll; 2) a method in which a powder or pellet of the perfluoroelastomer is melt-kneaded with a powder or pellet of the fluoro-resin with a device such as a mixer or a twin-screw extruder; and 3) a method in which the fluoro-resin is added during the step of preparing the perfluoroelastomer.

An example of the method 3) includes a method in which an aqueous dispersion of the perfluoroelastomer and an aqueous dispersion of the fluoro-resin both prepared by an emulsion polymerization method are mixed together and then the resultant mixture is co-coagulated to produce a mixture of the perfluoroelastomer and the fluoro-resin.

<Sealing material>

A crosslinked molded product such as a sealing material can be produced by the crosslinking and molding (vulcanization molding) of the perfluoroelastomer composition. That is, the sealing material is composed of a crosslinked product of the perfluoroelastomer composition. The crosslinking and molding can be carried out by pre-molding the perfluoroelastomer composition if necessary and then press-molding the pre-molded product using a mold. The molding temperature is for example about 150 to 220°C. The molding may be carried out by feed press molding, injection molding, extrusion molding or the like. If necessary, secondary crosslinking may be carried out at a temperature of about 150 to 320°C.

After the step of carrying out crosslinking and molding (press molding) as described above, there may be provided a step of irradiating the molded product with an ionizing radiation to cause the crosslinking in the molded product. Thus, the compression set characteristics can be further improved. As the ionizing radiation, an electron beam or γ -ray can be preferably used.

The sealing material can be a packing, a gasket or the like. The shape of the sealing material is appropriately selected depending on the intended use thereof, and a typical example thereof is an O-ring having an O-shaped cross section. The sealing material according to the present invention exhibits good ozone resistance and/or compression set characteristics even under a high-temperature environment, so that it

can be suitably used as a sealing material for maintaining the degree of vacuum in a device using ozone under a high-temperature environment, such as a device used in a film forming process in producing a semiconductor device or a flat panel display.

EXAMPLES

5 Hereinafter, the present invention will be described in more detail with reference to Examples and Comparative Examples; however, the present invention is not intended to be limited thereto.

 <Examples 1 to 11, Comparative Example 1>

10 A perfluoroelastomer composition was prepared and then a sealing material was produced in accordance with the following procedure. First, according to the blending compositions shown in Table 1 (the unit for each of the blending amounts in Table 1 is part(s) by weight), predetermined amounts of blending agents were kneaded with an open roll. Next, the resultant perfluoroelastomer composition was press-molded under a condition of 165°C for 20 minutes, and then subjected to secondary
15 crosslinking by heat under a condition of 230°C for 16 hours to obtain a sealing material (O ring).

[Table 1]

		Examples											Comparative Examples
		1	2	3	4	5	6	7	8	9	10	11	1
Perfluoroclastomer	FFKM 1 (Elastomer component)	100	100	100	100	100	100	100	100	100	100	100	100
Fluororesin	Fluororesin 1 (Derived from FFKM 1)	11	11	11	11	11	11	11	11	11	11	11	11
Crosslinking agent		1	1	1	1	1	1	1	1	2	2	1	1
Co-crosslinking agent (Derived from FFKM 1)		2	2	2	2	2	2	2	2	2	2	2	2
Organic pigment	A	0.1											
	B		0.1										
	C			0.1		0.3	0.6	0.1	0.3	0.1	0.3	1.1	
	D				0.1								
Ozone resistance	Weight loss rate (%)	1.11	1.14	1.10	1.09	1.01	0.98	1.02	1.01	1.15	1.18	1.19	1.27
Compression set (200°C, 72 h)		19	18	20	20	23	24	23	25	26	24	31	18
Compression set (260°C, 72 h)		42	42	49	53	50	55	54	53	52	55	59	63

The details of the blending agents used in Examples and Comparative Examples above are as follows.

[1] FFKM 1: a composition containing a perfluoroelastomer which is a tetrafluoroethylene-perfluoro (alkyl vinyl ether)-iodine atom-containing perfluoro (alkyl vinyl ether) copolymer, a co-crosslinking agent represented by the formula (1), and polytetrafluoroethylene particles ("Tecnoflon PFR5910M" manufactured by Solvay Specialty Polymers Co., Ltd.). In Table 1, the content (parts by weight) of a perfluoroelastomer contained in FFKM 1 is shown in the column of "FFKM 1"; the content (parts by weight) of a fluoroelastomer contained in FFKM 1 is shown in the column of "Fluoroelastomer 1"; and the content (parts by weight) of a co-crosslinking agent represented by the formula (1) contained in FFKM 1 is shown in the column of "Co-crosslinking agent".

[2] Crosslinking agent: 2,5-dimethyl-2,5-di(t-butylperoxy)hexane ("Perhexa 25B" manufactured by NOF Corporation).

[3] Organic pigment A: C.I. Pigment Blue 60,
[4] Organic Pigment B: C.I. Pigment Blue 177,
[5] Organic pigment C: C.I. Pigment Red 149,
[6] Organic pigment D: C.I. Pigment Red 178.

(Evaluation of sealing materials)

As for the obtained crosslinked molded products (sealing materials), the following items were measured and evaluated. The results are shown in Table 1.

[1] Evaluation of ozone resistance

An ozone exposure test was conducted, in which the sealing material was placed under an environment of an ozone concentration of 200 g/m^3 and a temperature of 160°C for 72 hours. The weight of the sealing material before and after the test was measured, and a weight reduction rate was calculated according to the following formula:

weight loss rate (%) = $\{(\text{weight before test} - \text{weight after test}) / (\text{weight before test})\} \times 100$.

[2] Compression set of sealing material

In accordance with JIS K6262, an O ring having a wire diameter ϕ of 3.53 was used for the measurement of the compression set of each of the sealing materials under conditions of 200°C for 72 hours and at a compression ratio of 25%, and 260°C for 72 hours and at a compression ratio of 25%.

<Examples 12 to 18, Comparative Examples 2 to 5>

A perfluoroelastomer composition was prepared and then a sealing material was produced in accordance with the following procedure. First, according to the blending compositions shown in Table 2 (the unit for each of the blending amounts in Table 2 is part(s) by weight), predetermined amounts of blending agents were kneaded with an open roll. Next, the resultant perfluoroelastomer composition was press-molded under a condition of 165°C for 20 minutes, and then subjected to secondary crosslinking by heat under a condition of 230°C for 16 hours to obtain a sealing material (O ring).

[Table 2]

		Examples							Comparative Examples			
		12	13	14	15	16	17	18	2	3	4	5
Perfluoroelastomer	FFKM 1 (Elastomer component)	100	100	100	100	100	100	100	100	100	100	100
Fluororesin	Fluororesin 1 (Derived from FFKM 1)	11	11	11	11	11	11	11	11	11	11	11
Crosslinking agent		1	1	1	1	1	1	1	1	1	2	2
Co-crosslinking agent (Derived from FFKM 1)		2	2	2	2	2	2	2	2	2	2	2
Organic pigment	C							0.05	2.0	5.0	10.0	20.0
	E	0.3										
	F		0.3									
	G			0.3								
	H				0.3							
	I					0.3						
	J						0.3					
Ozone resistance	Weight loss rate (%)	1.06	1.17	1.22	1.20	1.12	1.23	0.95	1.63	2.29	3.09	3.54
Compression set (200°C, 72 h)		32	24	21	20	29	23	29	33	43	59	66
Compression set (260°C, 72 h)		56	51	51	47	49	47	49	55	66	84	91

The details of the blending agents used in Examples and Comparative Examples above are as follows.

[1] FFKM 1: a composition containing a perfluoroelastomer which is a tetrafluoroethylene-perfluoro (alkyl vinyl ether)-iodine atom-containing perfluoro (alkyl vinyl ether) copolymer, a co-crosslinking agent represented by the formula (1), and polytetrafluoroethylene particles ("Tecnoflon PFR5910M" manufactured by Solvay Specialty Polymers Co., Ltd.). In Table 2, the content (parts by weight) of a perfluoroelastomer contained in FFKM 1 is shown in the column of "FFKM 1"; the content (parts by weight) of a fluoroelastomer contained in FFKM 1 is shown in the column of "Fluoroelastomer 1"; and the content (parts by weight) of a co-crosslinking agent represented by the formula (1) contained in FFKM 1 is shown in the column of "Co-crosslinking agent".

[2] Crosslinking agent: 2,5-dimethyl-2,5-di(t-butylperoxy)hexane ("Perhexa 25B" manufactured by NOF Corporation).

[3] Organic pigment C: C.I. Pigment Red 149,
[4] Organic pigment E: C.I. Pigment Red 179,
[5] Organic pigment F: C.I. Pigment Yellow 95,
[6] Organic pigment G: C.I. Pigment Yellow 110,
[7] Organic pigment H: C.I. Pigment Red 254,
[8] Organic pigment I: C.I. Pigment Violet 19,
[9] Organic pigment J: C.I. Pigment Yellow 139.

(Evaluation of sealing materials)

The ozone resistance and compression set of each of the resultant crosslinked molded products (sealing materials) were measured and evaluated in the same manner as in Examples 1 to 11 and Comparative Example 1. The results are shown in Table 2.

CLAIMS

1. A perfluoroelastomer composition comprising:
a perfluoroelastomer;
5 a peroxide crosslinking agent;
a co-crosslinking agent that is a diolefin compound; and
an organic pigment,
wherein
the diolefin compound is represented by the following formula (1):
10
$$\text{CH}_2=\text{CH}-(\text{CF}_2)_n-\text{CH}=\text{CH}_2 \quad (1)$$

where n in the formula (1) is an integer of 4 to 12; and
a content of the organic pigment is greater than or equal to 0.05 parts by weight
and less than 2 parts by weight with respect to 100 parts by weight of the
perfluoroelastomer.
15
2. The perfluoroelastomer composition according to claim 1, wherein the
perfluoroelastomer does not contain an inorganic filler.
3. A sealing material comprising a crosslinked product of the
20 perfluoroelastomer composition according to claim 1 or 2.