

UNIPLEX 214
N-BUTYLBENZENE SULFONAMIDE
CAS NO. 3622-84-2

GENERAL:

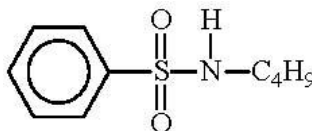
Uniplex 214 (N-Butylbenzene sulfonamide or BBSA) is a liquid sulfonamide plasticizer for a number of resins, such as polyacetals, polycarbonates, polysulfones, and polyamides especially Nylon-11 and Nylon -12. The addition of this plasticizer contributes the following properties:

- Easier removal from molds
- Easier machining
- Better finish
- Good heat stability to 80°C
- Better shape stability due to reduced water absorption

Uniplex 214 is the preferred primary plasticizer for polyamide resins, greatly enhancing low temperature flexibility. Uniplex 214 may be added either pre-or post-polymerization for Nylon-11 or 12, and in the extrusion of other polyamides (e.g. Nylon 6, Nylon 66). It is typically used at levels of 5 - 20%, based on the weight of the polymer.

Uniplex 214 is used in such applications as molded polyamide parts, nylon fishing line, nylon-based adhesives for nonwoven interlinings, auto fuel line, coil air hoses, and other high performance applications.

CHEMICAL STRUCTURE:



N-Butyl Benzene
Sulfonamide

MOLECULAR WEIGHT:

213.3 g/mole

EMPIRICAL FORMULA:

C₁₀ H₁₅ NO₂ S

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SPECIFICATIONS:

Appearance	Clear liquid
Odor	Mild
Color, Pt-Co Units	50 maximum
Water Content, %	0.1 maximum
Basicity, meq/kg	4 maximum
Assay	99% minimum

PROPERTIES:

Specific Gravity, 20°C	1.145 - 1.152
Vapor Pressure, 150°C	0.35 mm Hg
Vapor Pressure, 250°C	13 mm Hg
Flash Point	200°C (Cleveland Closed Cup)
Pour Point	- 30°C
Refractive Index, 20°C	1.522 - 1.526
Boiling Point (at 760 mm Hg)	340°C (dec.)
Viscosity, 20°C	150 - 180 cps

SOLUBILITY:

Almost insoluble in water; slightly soluble in alcohol and benzene.

TOXICOLOGY:

A static non-renewal toxicity bioassay for the acute toxic response of Ceriodaphnia dubia (USEPA 600/4-90/027, Methods for measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms) with Uniplex 214 shows LC₅₀ in 48 hours at a concentration of 25 mg/L. At 8.4 mg/L concentration, 10% of the population would die in 48 hours.

Acute oral toxicity, LD₅₀ - Mice: 2.9 g/kg

Acute oral toxicity, LD₅₀ - Rats: 2.17 g/kg

Acute inhalation toxicity, LD₅₀ (mice and rats): > 3 mg/m³

Acute dermal toxicity, LD 50 (Rabbits): > 1.15 g/kg

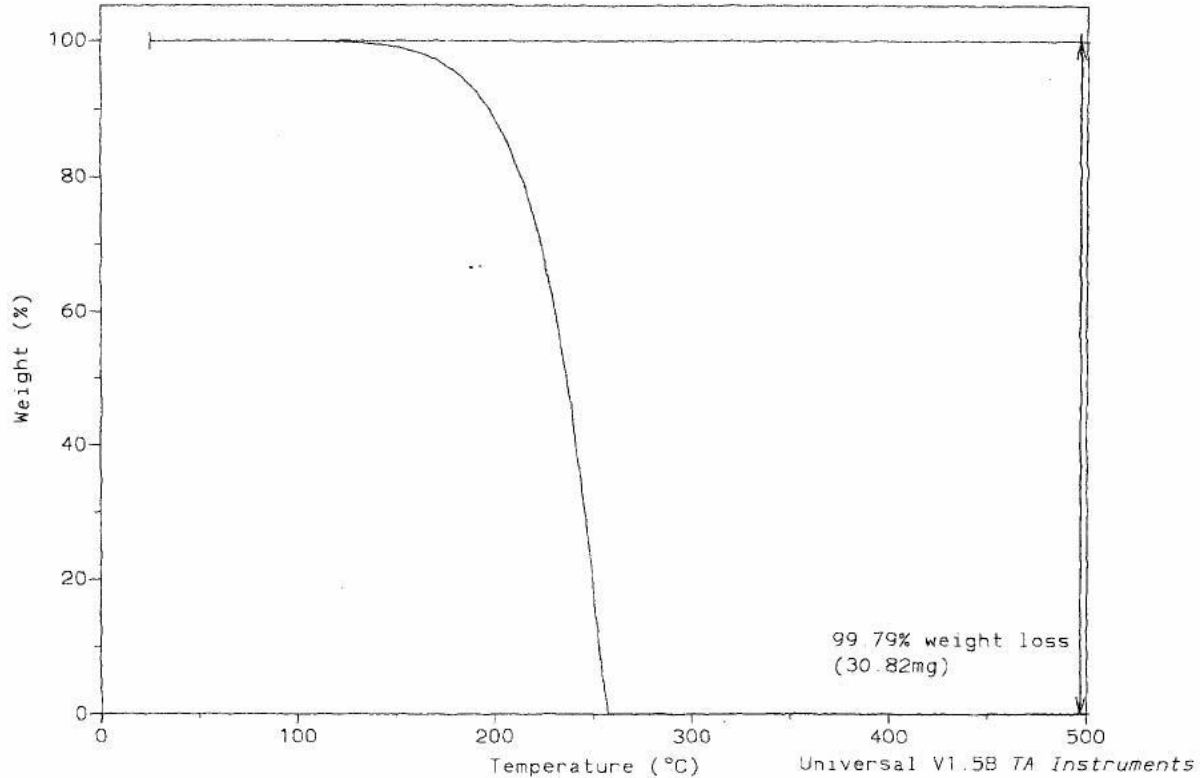
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THERMOGRAVIMETRIC ANALYSIS:

Sample: Uniplex 214
Size: 30.8880 mg
Method: Unitex
Comment: 65cc/min N2purge, 9600119T

TGA

File: D:\TA\TGA\DATA\UNITEX.004
Operator: Gary Sweetapple MS 5-23-96
Run Date: 23-May-96 13:03



REGULATORY INFORMATION:

Uniplex 214 (Benzenesulfonamide, N-butyl) is listed:

- on the TSCA Inventory (June 1998 Inventory Tape)
- on DSL (Canada) in Supplement to Canada Gazette, Part I, January 26, 1991,
- on EINECS (EINECS No. 222-823-6) in the Annex to the Official Journal of European Communities, 15 June 1990
- on ECL (ECL Serial No. KE-04206) in Korean Existing Chemicals List, January 1997
- on ENCS (Japan, ENCS No.3-1894; 3-1917) in Japanese Gazette contained within the class: Low Molecular Carbo-monocyclic Organic Compounds.
- on AICS (Australia) in Australian Inventory of Chemical Substances, June 1996 Ed.

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HANDLING INFORMATION:

Store in tightly closed containers (e.g. drums or totes) in a cool, dry location. This material is slightly hygroscopic. The shelf life is in excess of 3 years.

The preferred chemical transfer hose is a hose with a crosslinked polyethylene tube inside a Neoprene cover like the Corru-Chem N-2639 chemical hose supplied by Goodall. Gaskets should be of constructed of Viton or Tefzel. Neoprene and EPDM rubbers are not recommended. Piping, valves, and tanks should be constructed of stainless steel.

Storage tanks located outside in ambient conditions should be equipped with heating capability (e.g. internal heating coils, external tank coils or external heat exchangers). Tanks should be protected with a desiccation system and a conservation vent. Centrifugal pumps with single mechanical seals (e.g. 2 inch X 3 inch X 10 inch impeller, 10 HP motor) has been demonstrated in plant conditions to be excellent for transferring this product.

Uniplex 214 is shipped in 55 gallon tight head steel drums at 500 pounds net weight, disposable tote tanks at 2500 pounds net weight, as well as in bulk shipments, including iso-containers for overseas shipments. All shipments originate from Greensboro, North Carolina.

Avoid inhaling vapors. Use chemical resistant gloves and safety glasses with side shields.

Refer to the Material Safety Data Sheet for other handling instructions.

APPLICATIONS:

Uniplex 214 is the plasticizer of choice for nylon plastic applications to modify the flexibility of the nylon, particularly at low temperatures. There are many factors affecting the choice of a specific nylon for a particular application, such as tensile, flexural, compressive and shear properties as well as impact strength and hardness. These properties can be obtained from the nylon manufacturer.

Once the nylon having the most closely matching properties to those desired for the intended use, Uniplex 214 can be compounded with the nylon to modify it's properties as required.

Typically, plasticized nylons are used in applications where flexibility, particularly at low temperature is important. Some suggested applications are shown in Table I.

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RELEVANT PATENT LITERATURE:

Plasticized nylon balloons for medical devices

Reference: WO 9836783 A1 19980827

Disclosed is a balloon for use in a medical device made of a material comprising a plasticized polyamide having a glass transition temp. of less than about 32°C. The polyamide may be Nylon -11 or Nylon-12, the plasticizer may be BBSA, and the material may also include a stabilizer. A method for making a balloon for use in a medical device includes (1) providing a tube made of a material comprising a plasticized polyamide; (2) disposing the tube in a balloon mold; (3) heating the tube to a temperature within the softening temperature range of the material;(4) pressurizing the tube to conform it with the mold, thus producing a balloon; and (5) removing the balloon from the mold. The method also includes cooling the balloon to within the setting temperature range of the material before removing the balloon from the mold.

Long open time polyamide hot melt adhesive compositions

Reference: US 5672677

The title polyamide comprises the condensation product of substantially equivalent quantities of (a) an acid component of 1 polymeric fatty acids 1 dicarboxylic acids and (b) an amine component of (i) .gtoreq.2 noncyclic aliphatic diamines and (ii) 1 amine-terminated polyglycol diamines, optionally an aromatic sulfonamide plasticizer. The amine component is substantially free of piperazine-containing polyamines. The adhesive has an open time (ASTM D 4497) 120 seconds. Preferred noncyclic aliphatic diamines are ethylenediamine and 1,6-diaminohexane, present in about equimolar amounts. The polyamide from fatty acids, azelaic acid, Jeffamine D 400, ethylenediamine, and 1,3-diaminobutane had open time 390 seconds, heat resistance 211°F, and Shore A hardness 80.

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Polyamide resin composition and tubular molding comprising the same

Reference: EP 748847 A2

A polyamide resin composition comprising: (A) 100 parts by wt. of at least one member selected from a polyamide-11 resin and a polyamide-12 resin, optionally (B) from 3 to 30 parts by weight of a modified polyolefin resin, and (C) from 3 to 25 parts by wt. of a mixture of plasticizer (C₁) and plasticizer (C₂). The modified polyolefin resin (B) is either a modified polyolefin (B1) which is a copolymer of an olefin comprising at least one of ethylene and propylene, with an α,β -unsaturated carboxylic acid or a derivative thereof, or a modified polyolefin (B2) which is a graft polymer obtained by grafting and α,β -unsaturated carboxylic acid or a derivative thereof onto a copolymer of an olefin comprising at least one of ethylene and propylene. The plasticizer (C₁) has a solidifying point of -40°C or lower and is at least one member selected from the group consisting of phthalic esters, fatty acids esters, polyhydric alcohol esters, phosphoric esters, trimellitic esters, and epoxy plasticizers, and the plasticizers (C₂) is at least one member selected from the group consisting of benzenesulfonic acid alkylamides, toluenesulfonic acid alkylamides, and alkyl hydroxybenzoates. The resulting tubular moldings exhibit good flexibility and low-temperature impact resistance, and retains a nontacky surface after long-term use at high temperatures, and the plasticized compositions are moldable at 50m/min.

Plasticized polyamide manufacture by heating under pressure

Reference: SU 1819269

Cold-impact toughness of polyamide articles is increased when the starting mixture contains H₃P₄O₁₀ 0.1-0.35, dodecalactam 100, o-ethylenediaminephthalato-copper complex 0.01-0.03, stabilizer 0.032-0.07, adipic acid (to control molecular weight) 0.05-0.4, water 2.0-4.0, and optional additives 0.2-1.2 parts. The mixture is heated for 3 h at 265-290°C and 14 atm, followed by release of pressure and addition of 8-16 weight parts N-butylbenzenesulfonamide. The stabilizers are KI and MgCl₂.

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Method for blending polyamides with plasticizers

Reference: DE 4301809 A1 19940728

Polyamides are blended with plasticizers by mixing solid polyamide with a plasticizer (N-alkyl benzenesulfonamides) at 80°C, at a temperature 10°C lower than the polyamide melting temperature, in a shovel or tumble drier. Thus, 7 tons of granulated polyamide 1012 (melting point 192°C, viscosity no. 170) preheated to 128°C was sprayed for 6 hours under nitrogen with 350 kg BBSA (preheated to 70°C) with tumbling in a 20-m³ -drier to give polyamide containing 4.8% plasticizer (HPLC).

Polyamide monofilaments for long-line fishing

Reference: JP 06017308

Title filaments with glass transition temperature (T_g) to 40°C and diameter to 1.0 mm are prepared by melt spinning compositions comprising nylon 6-nylon 66 copolymer (I) 85-95, sulfonamide-based plasticizers 5-15, and epsilon-caprolactam 0-10, quenching the fibers in a coolant at 10°C, and drawing them. A mixture of 94 parts I and 6 parts N-butylbenzenesulfonamide was melt spun at 240.degree., quenched in a cooling bath at 8°C, drawn 4.3-fold at 175°C, subsequently drawn 1.35-fold at 185°C, and heat-set at 170°C to give transparent monofilaments with T_g 39°C, diameter 1.8 mm, and good circular cross section.

Processing aids for improving the flowability and mold parting property of polyphenylene sulfide resins

Reference: JP 05059279

The title aids are aromatic sulfonamide compounds. A polythiophenylene (M2588) containing 3 phr N-butylbenzenesulfonamide exhibited the claimed improvements.

Transparent caulks containing fumed silica

Reference: US 5124384

Adding 2-10% C₁₋₈ alkyl aryl dipthalate, and N-(C₁₋₈ -alkyl) arylsulfonamide or their mixture to the title sealant improves the transparency of an otherwise translucent title composition. Thus, Flexbond 662 DEV emulsion containing Cabosil M-5, surfactant, thickener, and silane coupler was transparent with the addition of N-butylbenzenesulfonamide at binder/plasticizer ratio 15:1.

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Antistatic thermoplastic elastomer compositions

Reference: JP 03237164

The nonbleeding title compositions comprise polyboron compounds (N-containing charge-transfer complexes) and sulfonamides, hydroxybenzoic acid esters, and/or hydroxyphthalic acid esters. Thus, a injection-molded sheet of a blend of Pelprene 100, High-Boron CTN-131 P (polyboron compound) 1, and N-butylbenzenesulfonamide 5 parts generated <1 V when placed 20 seconds under 7.5 kV and 50% relative humidity, versus 1860 V for Pelprene only.

Thermoplastic polyester elastomer compositions

Reference: JP 03086754

The title compositions, heat-resistant with low hardness and good flow, comprise 100 parts thermoplastic polyester elastomers and 5-100 parts sulfonamides, hydroxybenzoic acid esters, or hydroxyphthalic acid esters. Thus, a sheet injection-molded from a blend of 100 parts Pelprene P 30B and 20 parts N-butylbenzenesulfonamide showed hardness (JIS A) 59, breaking strength 137 kg/cm², tear strength 50 kg/cm, abrasion resistance (DIN 53516) 108 mm², melting point 159°C, and flow length (20 mm wide, 1 mm thick) 23 cm versus 71, 145, 53, 96, 162, and 13, respectively, for Pelprene P 30B.

Curable epoxy resins containing polyamines and dissecondary diamines

Reference: DE 3934428

The title compositions, giving gasoline-resistant, flexible cured products with good adhesion and tensile and impact strength, contain epoxy resins, 1 mole (cyclo)aliphatic polyamine containing to 3 active H atoms/mole, 0.25-4 mole diamine Z(NHR)₂ [R = alkyl, hydroxyalkyl, oxaalkyl, -CH₂CH₂CN, -CH₂CH₂CO₂-Bu-tert; z = (cycloalkylene, hydroxyalkylene, oxaalkylene), and 50-350% (based on amines) BBSA. A mixture of bisphenol A epoxy resin (epoxy no. 0.53) 1140, 2,2 (or 4), 4-trimethyl-1,6-hexanediamine 158, 2:1 2-ethylhexylamine-1,6-hexanediol diglycidyl ether reaction product 550, BBSA 300, and (Me₂NCH₂)₂C₆H₄OH 3 parts had shore D hardness after 7 days at 25°C 73, tensile strength 42 N/mm², elongation 42%, and cut growth resistance 96.6 N/mm.

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Curable epoxy resins containing polyamines and aliphatic monoamines

Reference: DE 3934429

Epoxy resins curing at ambient temperatures to adherent, flexible moldings with good tensile and impact strength contain mixtures of (cyclo)aliphatic polyamines containing to 3 active hydrogen atoms/mole and C₈₋₂₀ alkylamines (optionally containing ether bonds) in mole ratio 1:0.25-4 and 50-350% (based on amines) BBSA. A 4-mm film of a mixture of bisphenol A epoxy resin (epoxy no. 0.53)1140, 2,2 (or 4), 4-trimethyl-1,6-hexanediamine 158, 3-(hexyloxy)propylamine 159, and BBSA 450 parts containing 3% (Me₂NCH₂)₂C₆H₄OH had Shore D hardness 46 after 7 days at 25°C, tensile strength 13.5 N/mm², elongation 33%, and cut growth resistance 92N/mm.

Flame-retardant polyamide resin compositions

Reference: JP 63089568

Flexible title compositions comprise 100 parts mixture of 50-90% polyamide selected from polymers of C4-12 Ω-aminocarboxylic acids or lactams and polymers from aliphatic dicarboxylic acids and aliphatic diamines having a total number of carbons of 20 and 5-50% elastomer containing polyamide hard segments and polyoxyalkylene soft segments, 15-50 parts plasticizer, and 8-30 parts flame retardants. A mixture of Daiamide L-2140 75 parts, dodecanedicarboxylic acid-lauro lactam-poly-THF copolymers 25 parts, N-Butylbenzenesulfonamide 20 parts, 2-ethylhexyl-p-hydroxybenzoate 20 parts, decabromodiphenyl oxide 12.6 parts, and Sb₂O₃ 5.6 parts gave injection moldings having flexural modulus 1850 kg/cm² and flame resistance rating (UL 94) V-0, versus 2400 and HB, respectively.

Thermoplastic antistatic nylon compositions

Reference: EP 264269

The title compositions contain nylon (co)polymers, prepolymers or mixtures, and 10-80% aromatic sulfonamides as antistatic agents. Thus, a blend of 70% Nylon 12 and 30% BBSA had a static decay time of 0.36 seconds, versus >50 for a 8.5:90:1.5 Nylon 12-EVA-BBSA blend.

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Polyamide monofilaments with improved flexibility

Reference: JP 62170515

Flexible polyamide monofilaments with good breaking tensile strength, elongation at rupture, and spinning stability are manufactured by melt spinning compositions containing polyamides 80-96, epsilon-caprolactam 2-10, and plasticizers with low molecular weight 2-10 parts (total 100 parts) and 0.1-0.5 parts ethylene-bis(stearamide). Thus, 90 parts nylon 6 was mixed with 5 parts caprolactam, 5 parts BBSA, and 0.3 parts ethylene- bis (stearamide), melt spun at 260°C, cooled in a water bath at 20°C, then drawn to draw ratio 4 in a water bath at 95°C to give monofilaments with good spinning stability. The monofilaments showed a bending stiffness 1.7 kg, breaking tensile strength (JIS L1013) 3.1 g/denier, elongation at rupture 49%, versus 3.8 kg, 2.9 g/denier, and 47% respectively for monofilaments obtained from mixtures of 95 parts nylon 6 and 5 parts caprolactam.

Poly(ethylene terephthalate) monofilaments

Reference: JP 62170516

High-tenacity polyester monofilaments for racket guts and fishing lines, with low tensile strength variation, are prepared by melt spinning mixtures containing poly (ethylene terephthalate) and plasticizers, initially drawing the monofilaments in water, at 90-99°C to draw ratio 2.51-2.798 then drawing them in gas at 220-290°C to draw ratio 2.2-3, and finally heat-treating them at 230-280°C. Thus, a mixture containing poly (ethylene terephthalate) and BBSA was melt spun, and drawn into water at 97°C to a draw ratio of 2.65, subsequently drawn at 270°C to a draw ratio of 2.61 and heat-treated at 260°C to give monofilaments with tenacity 7.6 g/denier and knot strength of 7.3 g/denier. These monofilaments exhibited a standard variation of tensile strength 0.19, standard variation of knot strength 0.18, and degree of fibrillation 0.3%, versus 0.238, 0.22, and 2% respectively for fibers spun from a similar composition without BBSA.

Metal salt-containing polyamide compositions

Reference: JP 62013451

Compositions with good processability, impact resistance, and transparency comprise of a polyamide (with <14 amide groups/100 carbon atoms) 100 parts, a halide or pseudo-halide of 1-3 valent metal 0.01-0.05 parts, and a plasticizer 5-40 parts. A mixture of L1901 (nylon 12) 100 parts, MgCl₂ 5 parts, and BBSA 17 parts was injection molded to give a sheet having good transparency, Izod impact at -40°C, 23.8 kg-cm/cm, and elastic modulus 3800 kg/cm², versus bad transparency, 3.5, and 3900, respectively, for a sheet without MgCl₂.

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Blown film extrusion of polyamide films

Reference: JP 60049085

Films of thickness to 100 micrometers are prepared by extruding polyamides [relative viscosity 3.00-3.50] containing 0.05% sulfonamide plasticizer and/or fatty acid derived lubricant at 220-230°C and drawing. Thus nylon 6 (relative viscosity 3.4) containing 0.1% BBSA and 0.05% Magnesium stearate was extruded at 220°C to a film of 29.1 micrometers which was drawn 4.20:1 and then 10.5:1 and heated at 190°C. The film had a thickness of 14.2 micrometers, fineness 905 deniers, strength 4.83 g/denier, elongation 18.9%, and a Young's modulus 168.2 kg/mm².

Heat-resistant moldable plastic magnet composition

Reference: JP 60156751

The title compositions which give plastic magnets with good heat resistance and magnetic and mechanical properties are composed of (A) 5-30% polyamide resin compositions containing nylon 11 or nylon 12 (relative viscosity 1.2-1.8) 100, plasticizers 1-35, and stabilizers 0.1-2.0 parts, and (B) 70-95% powdered magnetic materials. Thus nylon-12 (relative viscosity 1.30) 100, BBSA 5, and Irganox 1010 1 part were mixed to prepare a polyamide resin composition, of which 12 parts were mixed with 88 parts Strontium ferrite (average particle diameter 1.24 micrometers) to prepare a composition with mixing torque 800 m·kg and a melt index of >40 g/10 min (280°C, 10 kg load). The composition was extruded twice and injection molded to prepare a plastic magnet test piece having tensile strength at break 580 kg/cm², tensile modulus 1300 kg/mm², and Izod impact strength 5.8 kg-cm/cm.

Thermoplastic, oil-resistant polymer compositions

Reference: JP 60173047

Pliable, moldable compositions having high resistance to oils contain 100 parts of a mixture of 30-99 parts polyamide and 1-70 parts acid-modified olefinic copolymer and 1-40 parts plasticizer. Thus, nylon-12 60, BBSA 10, and maleic acid-modified copolymer 30 parts, were kneaded, pelletized, and molded. The modified copolymer was prepared by treating Tafmer P 0280 (ethylene-propylene copolymer) with 1% maleic anhydride in the presence of 1,3-bis(tert-butylperoxypropyl)benzene. Immersion of the moldings in oil (JIS no. 3) at 100°C for 90 days increased the volume by 3.5% and the weight by 3.9%. The increases were 13.5 and 12%, respectively, for a composition containing no BBSA. The oil-resistant composition has better moldability.

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Polyamide monofilaments for fishing lines

Reference: JP 59203439

Compositions containing polycaprolactam or a copolyamide, a plasticizer, a coloring agent. And polyethylene are useful for manufacture of monofilaments with high tenacity and improved abrasion resistance. Thus, a composition of 90:10 (weight ratio) nylon 6-nylon 66 copolymer containing BBSA7, G 8 (coloring agent) 0.3, and polyethylene 3.0% (on nylon co-polymer weight) was melt spun, solidified, and drawn 440% at 150°C to give monofilaments with tenacity of 8.0 g/denier and high abrasion resistance.

Glass-fiber reinforced polyamides

Reference: JP 59161461

The compositions contain 30-86 weight % polyamides, 10-50% glass fibers, and 4-20% aromatic sulfonamides. They are excellent in impact resistance, surface smoothness, and moldability, and hence are applicable to injection, extrusion, and blow moldings. Thus, nylon-6 45, silane compound-treated short glass fibers 45, and BBSA 10 weight% were thoroughly mixed and molded to prepare pellets, which were injection-molded at 260°C and 650 kg/cm². The molding showed tensile strength 160 kg/cm², impact strength (unnotched) 118 kg-cm/cm², and falling ball impact strength 103 kg-cm.

Polyester-amide molding compositions

Reference: JP 58168656

The title compositions comprise [A] an aliphatic poly (ester amide) consisting of 5-80% ester units (from C₂₋₆ aliphatic diol and a C₉₋₁₂ aliphatic dicarboxylic acid) and 20-95% amide units (from C₁₁₋₁₂ aliphatic amino acid or lactam or C₆₋₁₂ aliphatic diamine equimolar salt with C₉₋₁₂ aliphatic dicarboxylic acid) and [B] 1-100% aromatic sulfonamide plasticizer. The compositions have excellent impact resistance and are useful as parts for machines, automobiles, and electrical appliances. Thus, 11-aminoundecanoic acid 82.4, 1,4-butanediol 14.3, dodecanedioic acid 20.2, tetrabutyl titanate 0.1, and Irganox 1010 (antioxidant) 0.1 part were mixed to give a poly (ester amide) with a relative viscosity of 1.52, melting point 155°C, ester unit content 25 parts, and amide unit content 75 parts. Poly(ester amide) pellets (100 parts) and BBSA 7.5 parts were mixed, kneaded, and injection molded to give moldings with excellent physical properties.

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Filled polyamide compositions with silanes and sulfonamides

Reference: US 4399246

Molding compositions with good impact resistance comprise 50-75 parts polyamide containing 25-50 parts mineral filler, 0.2-0.9 parts aminoorganosilane, and 0.2-0.9 parts sulfonamide. Thus, a composition containing nylon 66 59.30, clay filler 39.5, BBSA 0.60, and γ -aminopropyltriethoxysilane 0.60 part was processed into test specimens having Gardner impact strength 14.5 J compared with 3.6 J when the sulfonamide was omitted.

Dyeing or printing of hydrophobic fibers

Reference: JP 57167465

Benzenesulfonamide derivatives are useful as carriers for dyeing or printing synthetic fabrics with hydrophobic dyes. Thus, Sumikaron Blue S-3RF conc.cake 23, naphthalenesulfonic acid salt-formaldehyde condensate 57, BBSA 20, and water 200 parts were mixed. A polyester fabric (100 parts) was dyed in a bath containing the mixed composition 4, water 2987, a leveling agent 3, acetic acid 1.2, and sodium acetate 4.8 parts for 60 minutes at 120°C to give a blue fabric with high color yield, whereas color yield was low for a fabric dyed with a similar composition without BBSA.

Release sheets for pressure-sensitive adhesives

Reference: JP 57002408

Compositions containing a resin, wax, a plasticizer, and <6% cellulose derivative have high adhesion to a pressure-sensitive adhesive and are useful as release sheets. Thus, Versalon DPX1112 (a polyamide) 20, Hoechst wax C 27, oxidized wax 20, BBSA 17, a modified terpene resin 14, and ethyl cellulose 2 and an antioxidant 0.1 part were mixed to give a release sheet with high adhesion to a pressure-sensitive adhesive.

Plasticization of polyamide resins

Reference: JP 56161426

BBSA is used as a plasticizer for polyamides containing <10 amide groups/100 carbon atoms. Thus 28 parts BBSA was absorbed on 100 parts of polylauro lactam pellets (8.3 amide groups/100 carbon atoms) at 120°C and injection molded to give a molding having stress 150 kg/cm² at 10% strain, compared to 360 kg/cm² for a molding containing no BBSA. Only 4 parts BBSA was absorbed on 100 parts pellets of polylauro lactam (with 16.7 amide groups/100 carbon atoms).

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Polyamide tubes

Reference: JP 55041621

Polyamides containing aromatic sulfonamide plasticizers and talc fillers are useful for molding tubes with improved surface uniformity. Thus nylon 6 containing 24 phr BBSA and 0.05% talc is molded to tubes with good surface uniformity.

Plasticized nylon 612 with improved zinc chloride resistance

Reference: US 4251424

The resistance of plasticized nylon 612 to $ZnCl_2$ is improved by the addition of a polyolefin composition, e.g. fumaric acid-grafted EPDM. Thus, a composition comprising ethylene-fumaric acid-hexadiene-propylene graft copolymer 4.0, polyethylene 25, and nylon 612 71% , were melt blended in an extruder. BBSA was injected into the melt. Test specimens prepared from the blend were tested for $ZnCl_2$ resistance, and no cracks were observed after 23 days immersion in 50% $ZnCl_2$ solution.

Electroconductive polyamide compositions

Reference: JP 54146849

Electroconductive polyamide compositions contained an electroconductive substance 5-40, plasticizer 3-30, and, optionally, a rubber (as an impact modifier). For example, a molded specimen of nylon 6 65, carbon black 15, BBSA 10, and nitrile rubber 10% had a volume resistance 5.2×10^2 ohm-cm and Izod impact strength 8.6 kg-cm/cm.

Polychloroprene latex

Reference: DE 2912508

Aging-resistant latexes are prepared by emulsion polymerization of chloroprene in the presence of 0.2-4 phr sulfonamides. Thus, redox polymerization of chloroprene at 10°C to 80% conversion in the presence of 1 phr BBSA gives a latex showing 2-point increase in Mooney viscosity (ML 1+4) after 5 hours at 40°C, compared with 20 in the absence of BBSA.

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Polyamide resin compositions

Reference: JP 54029360

Resin compositions having good mechanical strength and softness were prepared from nylon 6, ethylene-glycidyl methacrylate-vinyl acetate copolymer, ethylene-propylene rubber or Evaflex P 1407 and BBSA. Thus, a mixture of nylon-6 100, EPR EP07P 30, ethylene-glycidyl methacrylate-vinyl acetate copolymer 10, and BBSA 15 parts had good softness, elongation > 220%, bending strength 250 kg/cm², and bending modulus of elasticity 7500 kg/cm².

Plasticized composition of copolyetherester elastomer and aromatic sulfonamide

Reference: US 4123411

Sulfonamides are plasticizers which are compatible at high concentration with polyester-polyether rubbers. Thus, a Hytrel rubber (Shore D hardness 63) was blended with 20% BBSA to give a composition having a glass transition temperature -33.3°, loss tangent 6.1×10^{-2} , shear modulus 3.60 kg/cm², tensile strength at break 281 kg/cm², 100% modulus 161 kg/cm², Young's modulus 1167 kg/cm², and elongation at break 600%, compared with +1.5, 10×10^{-2} , 1230, 423, 204, 2331, and 570, respectively for rubber not containing BBSA.

Plasticizers for polyamide adhesives for bonding fabrics

Reference: JP 52091040

Compositions of 70-95 parts copolymers derived from >C10 nylon salts, caprolactam and lauro lactam and 5-30 parts BBSA are useful as hot-melt adhesive films for bonding fabrics; the bondings are resistant to dry cleaning and laundering. Thus, a composition of 90 parts copolymer derived from caprolactam 30, nylon 66 salt 30, and lauro lactam 40%, and 10 parts BBSA was

extruded to give a 90 micrometer film. The film was placed between 35:65 cotton-polyester blend fabrics and pressed at 140 °C to form a bonding having peel strengths 3.02, 2.90, and 2.75 kg/cm initially, after 3 times of dry cleaning for 15 minutes at 40°C, and after laundering for 15 minutes, respectively.

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Spin dyeing of polyamide fibers

Reference: JP 50085655

Dyes or pigments are mixed with sulfonamide derivatives to give pastes having viscosity 200-300 cP, and 0.03-1.0 part of the pastes is added to 100 parts polyamide chips for molding and spinning. Thus, 3 parts Luramid Yellow R and 15 parts Luramid Green B were stirred 30 minutes in 300 parts BBSA to give a paste having viscosity of 350 cP. A composition of 31.8 parts of the above paste and 20,000 parts nylon-6 chips was stirred 2 hours in a blender and melt-spun to give uniformly spin-dyed fibers.

Polyamide-polyurethane blends

Reference: JP 49034947

The thermoplastic composition contains 5-70 parts polyamide of melting point $<200^{\circ}\text{C}$ with 5-50 parts plasticizer or 5-70 parts internally plasticized copolyamide with or without 5-50 parts plasticizer and 30-95 parts thermoplastic polyurethane having rubber elasticity and lower flexural modulus than that of the polyamide. The soft composition has good processability and low permanent set. Thus, 100 parts nylon-12 and 20 parts BBSA were extruded and pelletized. The pellets (50 parts) and 50 parts Paraprene 22 S (polyurethane) were extruded and pressed to give test pieces with tensile strength 290 kg/cm^2 , elongation 280%, flexural modulus strength 1100 (20°C) and 3700 kg/cm^2 (-30°C) and permanent set 3.0%, compared with 310, 240, 4000, 7000, and 5.3, respectively.

Nonwoven bonded fabrics

Reference: GB 1066132

Water repellency, flame resistance, and increased resilience can be imparted to nonwoven bonded webs containing some plasticizable fibers. The fibrous structure of the plasticizable fibers is destroyed by heating. Upon cooling, the plasticizable fibers coalesce into droplets that bond the other fibers in the web together. For example, a thin fleece consisting of 80% viscose

rayon staple fiber (1.4 denier) and 20% of a plasticizable fiber compounded from a copolymer containing 88% vinylidene chloride and 12% vinyl acetate was sprayed with BBSA to give a 15 weight percent increase. The fleece was then formed by carding and laminating into a web weighing 300 g/m^2 and was heated at 120°C on a flat belt in a drying oven. The material obtained was made more flame retardant by treatment with a mixture of poly (vinyl chloride) 50, Sb_2O_3 20, methylene chloride 200, and tris (chloroethyl) phosphate is used instead of BBSA.

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TABLE I**TYPICAL USES OF PLASTICIZED NYLON ARTICLES**

	6	66	66/6	6/66/69	6/66/610	11	12	6/66/12	Wt% Uniplex 214
Hydraulic Hoses									12-15%
Pneumatic Hoses									3-15%
Automotive Air Conditioning:									
Hoses									10-20%
Hose Mandrel Rods									10-20%
Automotive Housings									5-15%
Automatic Fuel Lines									3-15%
Gears									2-10%
Seals									3-10%
Tubing									3-15%
Bellows									10-20%
Cable Ties									5-15%
Shoe Soles									7-15%
Fishing Lines									10-30%
Grass Trimmer Line									5-30%
Textile Bonding									15-20%
Fusible Interlining									15-20%
Thread Bonding									25-30%
Cable Jacketing									15-25%
Powder Coatings									5-15%

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