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(54) Title: PELLETIZED POLYMER FOR SOFT, DRAPEABLE NON-WOVENS

(57) Abstract: Provided is a propylene polymer composition comprising a neat polymer, a hydroxylamine ester compound and a plasticizer suitable for preparing low melt viscosity polymers useful in spinning, melt blowing, extruding and the like. Further provided are non-woven fabrics made from the composition. The fabrics exhibit superior drapeability, softness and handle. The polymer composition exhibits near-neat propylene polymer melt viscosity such that it can be readily pelletized for transport or use by an end user other than the composition manufacturer.

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PELLETIZED POLYMER FOR SOFT, DRAPEABLE NON-WOVENS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Provisional Application No. 60/794926, filed April 26, 2006, the disclosure of which is incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to a pelletized polymer composition for use in melt-spinning, spunbonding, melt blowing, centrifugal spinning, sheet slitting, film fibrillation, extruding and the like, especially to produce soft, drapeable non-woven fabrics.

BACKGROUND OF THE INVENTION

[0003] Ultra-low melt viscosity polymers, such as propylene and butylene polymers, are known to be useful for the production of such products as adhesives, sealants, coatings, non-woven fabrics produced by melt blown fiber processes, injection-molded components made at a high rate, deep draw stampable reinforced thermoplastic components and others.

[0004] Production of ultra-low melt viscosity ("ULMV") polymers by direct polymerization processes is, however, problematic. Due to their particular nature, such polymers can require complex and costly operations primarily in relation to the separation of ULMV polymers from the solvents in which the monomers are dissolved to facilitate the polymerization process. ULMV resins produced by in-reactor processes are supplied in a flake rather than pellet form, owing to the difficulty in pelletizing them. The flake form often results in the presence of a significant amount of powdery fines, creating difficulties in handling and transporting the material.

[0005] It is also known to produce relatively high melt viscosity polymers according to usual polymerization processes and then subject the polymer to a thermomechanical degradation process in the presence of a free radical generator. In theory, during this degradation, the free radical generator, such as a peroxide

or hydroxylamine ester, thermally degrades permitting the resulting free radical to break the macromolecular bonds of the polymer. This results in a polymer with lower average molecular weight, narrower molecular weight distribution ("MWD") and most importantly, a lower melt viscosity (and higher melt flow rate). Producing an ULMV polymer by this process is often called viscosity breaking or vis-breaking the polymer, and the free radical generator is often referred to as a viscosity breaking or vis-breaking agent.

[0006] Pelletization of thermoplastic materials is of great importance for many applications, particularly when the end user of the pellets is not the manufacturer of the polymer, thus necessitating shipment of the material. Pellets readily flow in measuring and dispensing apparatus and the size of pellet charges can be readily controlled with great accuracy. Pelletization of ULMV polymers, however, is difficult. See U.S. Patent Nos. 4,451,589; 4,897,452 and 5,594,074. ULMV polymers, upon leaving a pelletizing extruder are often in such a fluid and soft form that they are difficult or even impossible to cut into pellet form. Those pellets that can be formed may be non-uniform, sticky and have a tendency to agglomerate, thereby frustrating future processors. Non-uniform pellets of ULMV polymer may be described by such terms as "tailed pellets," "long-string pellets," "elbows," "dog bones" and "pellet trash," while the agglomerated pellets may be described by such terms as "pellet marriages." Additionally, ULMV polymer buildup on the pelletizer's rotating blades frequently results in unscheduled shutdowns, resulting in unacceptably low production rates and high maintenance costs. Further, the malformed pellets exhibit many characteristics undesirable among end-users, including altered bulk density of pellet stock (resulting in processing voids or inaccurate composition formulations), bridging or other feed problems in extrusion lines and incompatibility with existing conveyor-style transport devices. Finally, polymer production systems require long time periods to transition (hereinafter, "transition times") from production of low melt flow rate polymer production to high melt flow rate polymer production. Long transitions times limit production

efficiencies and result in the production of intermediate melt flow rate polymers with limited usefulness.

[0007] To avoid these problems, known processing techniques have used multi-step degradation processes wherein a vis-breaking agent is added to a polymer and the polymer is then pelletized. The processing and pelletization is conducted under conditions that provide a substantial amount of unreacted vis-breaking agent impregnated in the polymer pellet, but, unfortunately often resulting in some vis-breaking of the polymer,. Later processing by an end-user activates the remaining impregnated vis-breaking agent, thereby producing an ULMV polymer suitable for melt blown or other processes. U.S. Patent Nos. 5,594,074, 4,451,589 and 4,897,452 all describe processes for making polymer pellets containing an unreacted free radical generator. The processes of these three patents (more fully described below) use (1) a single vis-breaking agent added to the polymer at a single location along the length of an extruder, (2) a single vis-breaking agent that is added in two or more locations in the process, one near the feed throat of the pelletizing extruder and another near the exit or (3) two vis-breaking agents with significantly different half-lives added at different locations in the pelletizing process.

[0008] A single agent, single addition process is described in U.S. Patent 4,451,589. This process involves controlling the temperature and residence time in the pelletizing extruder to limit the activity of the vis-breaking agent prior to pelletizing. A single agent, multiple addition process is described in U.S. Patent 5,594,074. By making a second addition of vis-breaking agent near the exit of the pelletizing extruder and then quickly quenching the resulting pellets, the vis-breaking agent does not have sufficient time or thermal energy to degrade the polymer before quenching and remains available for further polymer degradation in later processing. The two agent process is described in U.S. Patent 4,897,452. This process uses two vis-breaking agents, one with a half life significantly longer than the other. By utilizing the shorter half-life agent early in the pelletizing process, the polymer is partially degraded. When the second, longer half-life agent is added to the polymer just before pelletizing, that agent does not

have sufficient residence time in the pelletizing extruder at sufficient temperature to degrade the polymer before quenching and remains available for further polymer degradation in later processing.

[0009] Another known method for producing low melt viscosity resins consists of coating higher melt viscosity polymer granules with peroxide so they crack to lower melt viscosity during subsequent processing. However, this method is disadvantageous in that the shelf-life of peroxide coated polymer granules ("PCGs") is insufficient to allow for long term storage or long distance transport of the PCGs from producer to end user.

[0010] Both flake form resin and PCGs present difficulties for the operations of many downstream processors through (1) incompatibility with material transport systems (i.e. conveyors), (2) end-user equipment that is not suited to processing polymer granules, but is rather, designed to process the much more widely used pellet form of polymer (resulting in lower through-put rates when granules are used instead of pellets), and (3) oxidation of the neat polymer by virtue of uneven distribution of stabilizer additives and the high surface-to-volume ratio of flakes and PCGs.

[0011] While many of the patents discussed herein describe the use of peroxide to decrease a polymer's melt viscosity, it is known to utilize hydroxylamine esters in much the same way. Hydroxylamine esters exhibit certain advantages over peroxides, including being safer and easier to handle and presenting less of a fire and explosion hazard. Additionally, hydroxylamine esters are, generally, more stable at higher temperatures than peroxides and thus, capable of being used to form vis-breaking agent impregnated pellets at standard polymer processing temperatures with minimal impact on the melt viscosity of the base polymer.

[0012] Many known processes for vis-breaking polymers start with usual reactor-grade polymer with a melt flow rate of between about 0.01 and 35 dg/min. Vis-breaking such a polymer to achieve a polymer capable of producing

high quality melt blown webs or fabrics (e.g. melt flow rate = 350-3500 dg/min) often results in creation of excessive quantities of oligomers in the ULMV polymer product. The presence of oligomers in melt blown and other processes that utilize ULMV polymers can cause (1) smoking, thereby imparting undesirable color or odor to the final article formed from the ULMV polymer, (2) oil and wax build-up and (3) may shorten the useful life of the melt blown die tip. Further, non-woven fabrics made from ULMV polymers with excessive quantities of oligomers can have levels of extractables that exceed regulatory limits (such as those promulgated by the United States Food and Drug Administration).

[0013] It would, therefore, be desirable to have a pelletized product that is compatible with existing material transport systems, does not suffer significant impairment of activity from exposure to air, exhibits long term shelf stability, is readily produced through existing polymerization techniques without requiring long transition times and, when heated and melt mixed during further processing, is capable of producing a narrow molecular weight distributed, ultra-low melt viscosity polymer containing a low level of oligomers (absent the addition of any plasticizers). Further, it would be desirable that the pelletized product is capable of forming non-woven fabrics with superior characteristics, including hydrostatic head to basis weight ratio, drapeability, softness and handle.

SUMMARY OF THE INVENTION

[0014] One aspect of the present invention provides a process for producing a polymer composition comprising the steps of mixing a neat polymer, a hydroxylamine ester compound and a plasticizer to form a blend, where the neat polymer exhibits a melt flow rate of 50 dg/min to 400 dg/min, the hydroxylamine ester is present in the range of about 0.01% to about 10% by weight and the blend exhibits a melt flow rate or melt index of not less than that of the neat polymer to about quadruple that of the neat polymer; and pelletizing the blend to form a blend pellet. The blend pellets may be processed further to create fibers and non-woven fabrics (alternatively called "webs") with superior barrier properties, desirable drapeability and softness.

[0015] Another aspect of the present invention provides a polymer composition comprising a neat polymer, a hydroxylamine ester compound and a plasticizer, where the neat polymer exhibits a melt flow rate or melt index of 50 to 400, the hydroxylamine ester is present in the range of about 0.01% to about 10% by weight and the blend exhibits a melt flow rate or melt index of not less than that of the neat polymer to about twice that of the neat polymer.

[0016] Yet another aspect of the present invention provides a non-woven fabric exhibiting significantly improved handle characteristics. In another aspect, the non-woven fabric of the present invention, either alone or in conjunction with other materials, may be used to produce articles, including, but not limited to, filter media, medical/surgical gowns and drapes, diapers, feminine hygiene or adult incontinence products, absorbent mats, wipes, masks and wet tissues.

DETAILED DESCRIPTION

[0017] While the present invention is susceptible of embodiment in various forms, there will hereinafter be described, presently preferred embodiments, with the understanding that the present disclosure is to be considered as an exemplification of the invention, and is not intended to limit the invention to the specific embodiments disclosed herein.

[0018] As used herein, these terms shall mean the following:

High melt viscosity polymer – a polymer with melt viscosity of 1,000,000 centipoise (“cps”) or more;

Ultra-low melt viscosity polymer – a polymer having a melt viscosity of about 300,000 cps or lower;

Neat polymer – a polymer as generated from the polymerization process and isolated from any polymerization solvent, excess monomer, etc. and not yet subjected to post-polymerization treatment to reduce viscosity or narrow the polymer's molecular weight distribution;

Oligomer – a polymer consisting of only a few monomer units such as a dimer, trimer, tetramer, etc., or their mixtures (the upper limit of repeating units in an oligomer shall be about one hundred);

Hydrostatic head (“Hydrohead”) – a measure in millibar (“mbar”) of the liquid barrier properties of a fabric;

Air Permeability – a measure in volume of air per unit time per unit area of fabric of the barrier properties of a fabric;

Basis weight – a measure in grams per square meter (“gsm”) of the fiber density of a non-woven fabric;

Handle – a measure according to INDA IST 90-3 in grams force using a Thwing-Albert Handle-O-Meter equipped with a 10 mm slot of a combination of a non-woven web’s flexibility and surface friction;

Particulate Filter Efficiency (“Filtration Efficiency” or “Filter Efficiency”) – a measure in percent (“%”) of a web’s (filter’s) ability to remove particles from a fluid stream that passes through the web (filter) based on the ratio of the amount of particulate matter in the stream after filtration to the amount in the stream before filtration (also known as penetration); and

Filter Quality – another measure of a web’s (filter’s) ability to remove particles from a fluid stream that passes through the web (filter) based on penetration (P) and the pressure drop across the web (Δp), according to the formula:

$$q_F = \ln(1/P) / \Delta p,$$

see WILLIAM C. HINDS, *Aerosol Technology: Properties, Behavior, and Measurement of Airborne Particles*, John Wiley & Sons, New York p. 170 (1982).

[0019] A polymer with a melt viscosity of about 300,000 cps will have a melt flow rate of approximately 100 dg/min, and is generally regarded as an ultra-high melt flow rate polymer. Melt indices (“MI”) and melt flow rates (“MFR”) are

determined using a Gottfert Melt Indexer, Model MPE. As used herein, the melt indices are measured by ASTM D1238 at 190 degrees Celsius ("°C") and 2.16 kg weight and melt flow rates are measured by ASTM D1238 at 230°C and 2.16 kg weight.

[0020] Hydrohead was determined using a TexTest FX3000 Hydrostatic Head Tester. Samples are clamped into place over a water-filled test head. Water pressure underneath the sample is increased at 60 mbar/min. The test is terminated when three drops of water penetrate the sample. Datum reported is water pressure (in millibar) at termination of the test. Hydrohead testing was conducted per INDA, Association of the Nonwoven Fabrics Industry Corporation ("INDA") IST 80.6 (98).

[0021] Air Permeability was determined using a TexTest FX 3300 machine with a pressure drop setting of 125 Pa. Specimens are clamped into place, and the flow rate of air through the sample is increased until the pressure drop reaches 125 Pa. A measurement is made of the flow rate of air and volume of air per unit area per unit time. This procedure is according to INDA's IST 70.1 (05) (equivalent to ASTM-D737-96).

[0022] Particulate filter efficiency was determined using a TSI Model 8130 automated filter tester. Two percent sodium chloride solution (20 g NaCl in 1 liter of water) was aerosolized by an aerosol generator. The NaCl/water drops in aerosol were heated and NaCl crystallites with a 0.075 μm diameter were formed. The mass concentration of NaCl in the air was 101 mg/m^3 . Photometry was used to detect the volume concentration of the air in the upstream volume of the media (C_u) at a face velocity of 5.3 cm/s and the volume concentration of the air in the downstream volume of the media (C_d). The penetration ability (P) of the NaCl particles was calculated as:

$$P \% = 100 \times (C_d / C_u),$$

and the particulate filter efficiency was calculated as:

$$\text{Filter Efficiency \%} = (100 - P).$$

[0023] Molecular weight distribution Mw/Mn ("MWD") is the ratio of weight average molecular weight ("Mw" as determined by gel permeation chromatography, hereinafter "GPC") to number average molecular weight ("Mn" as determined by GPC).

[0024] A propylene polymer composition according to the present invention comprises (1) a neat propylene polymer exhibiting a MFR of 50 to 400 dg/min, (2) a viscosity breaking agent, namely a hydroxylamine ester compound, present in the range of about 0.01% to about 10% by weight and (3) a plasticizer. The propylene polymer composition should exhibit a MFR of from not less than that of the neat propylene polymer to quadruple that of the neat propylene polymer. For example, if the neat propylene polymer exhibits a MFR of 75 dg/min before mixing with the hydroxylamine ester compound, then the composition of neat propylene polymer and hydroxylamine ester compound should exhibit a MFR of from 75 dg/min to 300 dg/min.

[0025] Neat Propylene Polymer

[0026] The neat propylene polymer of the present invention may be of any type known in the art for which viscosity breaking would be desirable, including, but not limited to, propylene polymers, propylene copolymers, polypropylene blends, propylene impact copolymers, polypropylene EPR blends, polypropylene EPDM blends, polypropylene elastomers and polypropylene vulcanizates. The neat propylene polymer of the present invention exhibits a MFR of from 50 dg/min to 400 dg/min, more preferably from 50 dg/min to 150 dg/min, even more preferably from 50 dg/min to 100 dg/min, and even more preferably from 50 dg/min to 75 dg/min. The neat propylene polymer may be polymerized using any means known to one of skill in the art for producing propylene polymers with the desired melt flow rates. Additionally, the neat propylene polymer may be mixed with any additive known to one of skill in the art to impart desirable

properties to the propylene polymer, including, but not limited to, oxidation stabilizers, acid scavengers, nucleating agents, and UV stabilizers.

[0027] Further suitable additives that may be included in the present invention are processing oils (aromatic, paraffinic and naphthenic mineral oils), compatibilizers, fillers (calcined clay, kaolin clay, nanoclay, talc, silicates and carbonates), pigments and colorants (carbon black), flame retardants, conductive particles, stabilizers, coupling agents (silanes and titanates), plasticizers, lubricants, antiblocking agents, antistatic agents, waxes, foaming agents and combinations thereof. Those of ordinary skill in the art will readily understand the selection and use of such additives.

[0028] **Hydroxylamine Ester Compounds**

[0029] The hydroxylamine ester compounds of the present invention may be any of those known in the art for reducing the molecular weight of, or viscosity breaking, polyolefin compounds, particularly propylene polymers, and are generally described in WO 01/90113 A1 by Roth, et al and incorporated herein by reference. A preferable hydroxylamine ester compound is sold commercially by Ciba Specialty Chemicals Corporation. under the trademark Irgatec® CR76. The hydroxylamine ester compound may be present in the range of about 0.01% to about 10% by weight, preferably from about 0.01% to about 7%, more preferably from about 0.01% to about 5%, more preferably from about 0.5% to about 4%, even more preferably from about 1% to about 3% based on the total weight of the neat propylene polymer.

[0030] **Plasticizers**

[0031] The plasticizer of the present invention is any compound which improves particular properties of the polymer concentrate directed towards softness, a depressed glass transition temperature, impact strength (e.g., Gardner impact), toughness, flexibility (e.g., lower flexural modulus), and or processability (e.g., higher melt flow) and the like.

[0032] The plasticizer may be present in an amount of from a selection of any two different values of the following range of endpoints (lower or upper): 0.1, 0.25, 0.5, 0.75, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0, 12.5, 15.0, 20.0 or 25.0 wt% based on the total weight of the neat propylene polymer. For example, the plasticizer may be present in the amount of from 0.1 to 20.0 wt%, 2.0 to 2.5 wt%, or even 0.75 to 5.0 wt% based on the total weight of the neat propylene polymer. Preferred ranges of the plasticizer include 0.1 to 10 wt%, more preferably 0.5 to 9.0 wt%, even more preferably 1.0 to 8.0 wt%, even more preferably 3.0 to 8.0 wt%.

[0033] Preferred plasticizers of this invention are characterized in that, when blended with the neat propylene polymer or neat propylene polymer/hydroxylamine ester composition, the plasticizer and the neat propylene polymer or neat propylene polymer/hydroxylamine ester composition form a homogeneous mixture or blend. Suitable plasticizers are well known to those of skill in the art.

[0034] Preferably, the plasticizer is miscible with the neat propylene polymer, as indicated by no change in the number of peaks in the Dynamic Mechanical Thermal Analysis trace (DMTA) determined according to ASTM D4065, as compared to the DMTA trace of the neat propylene polymer in the absence of the plasticizer.

[0035] Plasticizers suitable for use herein may comprise a paraffin, a hydrocarbon fluid, a polyalpha olefin oligomer, a polybutene, a mineral oil, a phthalate, a substituted phthalate, a substituted mellitate, a substituted adipate, or a combination thereof, wherein the substitutions comprise C₁ to C₂₀ hydrocarbons. In a preferred embodiment, plasticizers suitable for use herein include both functionalized and non-functionalized paraffins (e.g., isoparaffins, normal or linear paraffins, cyclic paraffins, dearomatized aliphatic hydrocarbons, high purity hydrocarbon fluids, mixtures thereof, and the like), polyalpha olefin oligomers ("PAOs"), polybutenes, and/or mineral oils.

[0036] Particularly preferred plasticizers include PAOs, Group III basestocks (including those derived from so-called Gas-To-Liquids processes), and mineral oils with VI > 100, pour point less than -20°C, specific gravity less than 0.86, and flash point greater than 200°C.

[0037] Preferably, the plasticizer is a PAO, which may be manufactured by the catalytic oligomerization or polymerization of olefins having 4 or more carbon atoms, preferably 5 or more carbon atoms. A PAO thus includes synthetic fluids produced by oligomerization and or polymerization. PAO's may also be functionalized to comprise, for example, esters, polyethers, polyalkylene glycols, and the like. (see *Synthetic Lubricants and High-Performance Functional Fluids*, Second edition, Rudnick, Shubkin, eds., Marcel Dekker, Inc. New York, 1999.)

[0038] Non-Functionalized Plasticizer

[0039] In a preferred embodiment, the polymer concentrate of the present invention includes a non-functionalized plasticizer ("NFP"). The NFP of the present invention is defined for use herein to include a compound comprising carbon and hydrogen, that does not include, to an appreciable extent, functional groups comprising oxygen, nitrogen, sulfur, and/or phosphorus (i.e., polar functional groups). Examples of such functional groups include hydroxide, carboxyls, esters, ethers, amines, and the like.

[0040] By an "appreciable extent", it is meant that functional groups and compounds comprising functional groups are not deliberately added to the NFP, and if present at all, are present at less than 5 wt%, based on the total weight of the NFP. More preferably, functional groups are present at less than 4 wt %, more preferably less than 3 wt %, more preferably less than 2 wt %, more preferably less than 1 wt %, more preferably less than 0.7 wt %, more preferably less than 0.5 wt %, more preferably less than 0.3 wt %, more preferably less than 0.1 wt %, more preferably less than 0.05 wt %, more preferably less than 0.01 wt %, more preferably less than 0.001 wt %, based upon the total weight of the NFP.

[0041] Paraffins

[0042] In an embodiment, an NFP may comprise, or may consist essentially of one or more paraffins. For purposes of the present invention and the description herein, the term "paraffin" includes all isomers such as normal or linear paraffins (n-paraffins), branched paraffins, also referred to as isoparaffins, and cyclic paraffins, preferably cyclic aliphatic paraffins. Paraffins may be derived synthetically by means known in the art, or may be refined from crude oil in such a way as to meet the requirements of an NFP as described herein. It is to be understood that the classes of materials described herein that are useful as NFP's can be utilized alone, or admixed with other NFP's, other plasticizers, and the like.

[0043] In an embodiment, an NFP may comprise, or may consist essentially of one or more C₆ to C₂₀₀ paraffins. In a preferred embodiment, the NFP may comprise C₆ to C₁₀₀ paraffins, more preferably C₆ to C₂₀₀ paraffins, more preferably C₈ to C₁₀₀ paraffins. In another preferred embodiment, the NFP may comprise C₂₀ to C₁₅₀₀ paraffins, preferably C₂₀ to C₅₀₀ paraffins, more preferably C₃₀ to C₄₀₀ paraffins, even more preferably C₄₀ to C₂₅₀ paraffins.

[0044] A preferred NFP or blend thereof may comprise a paraffin having one or more of the following properties:

1. a distillation range as determined by ASTM D 86 having a difference between the upper temperature and the lower temperature of 40°C or less, preferably 35°C or less, preferably 30°C or less, preferably 25°C or less, preferably 20°C or less, preferably 15°C or less, preferably 10°C or less, preferably 6 to 40°C, preferably 6 to 30°C; and/or
2. an initial boiling point as determined by ASTM D 86 greater than 50°C, preferably greater than 100°C, preferably greater than 120°C, preferably greater than 130°C, preferably greater than 140°C, preferably greater than 150°C, preferably greater than 160°C,

- preferably greater than 170°C, preferably greater than 180°C, preferably greater than 190°C, preferably greater than 200°C, preferably greater than 210°C, preferably greater than 220°C, preferably greater than 230°C, preferably greater than 240°C; and/or
3. a pour point of 10°C or less (as determined by ASTM D 97), preferably 0°C or less, preferably -5°C or less, preferably -10°C or less, preferably -15°C or less, preferably -20°C or less, preferably -25°C or less, preferably -30°C or less, preferably -40°C or less, preferably -50°C or less, preferably -60°C or less; and/or
 4. a specific gravity (ASTM D 4052, 15.6°C) of less than 0.88, preferably less than 0.85, preferably less than 0.80, preferably less than 0.75, preferably less than 0.70, preferably 0.65 to 0.88, preferably 0.70 to 0.86, preferably 0.75 to 0.85, preferably 0.79 to 0.85, preferably 0.80 to 0.84; and/or
 5. a final boiling point as determined by ASTM D 86 of less than 700°C, preferably 115°C to 500°C, preferably 200°C to 450°C, preferably 250°C to 400°C; and/or
 6. a weight average molecular weight (Mw) less than 21,000 g/mol determined by GPC, preferably 100 to 10000, preferably 500 to 5000, preferably 100 to 2000, preferably 150 to 1500, more preferably 200 to 1000 g/mol; and/or
 7. a number average molecular weight (Mn) of 100 to 2000 g/mol determined by GPC, preferably 300 to 10000, preferably 500 to 5000, preferably 150 to 1500, more preferably 200 to 1000; and/or
 8. a flash point as measured by ASTM D 56 of greater than -30°C, preferably -30°C to 150°C, more preferably greater than 200°C and/or
 9. a dielectric constant at 20°C of less than 3.0, preferably less than 2.8, preferably less than 2.5, preferably less than 2.3, preferably less than 2.1; and/or
 10. a density (ASTM 4052, 15.6/15.6°C) of less than 0.90 g/cm³, preferably 0.70 to 0.83; and/or
 11. a viscosity (ASTM 445, 25°C) of 0.5 to 20 cSt at 25°C; and/or

12. a carbon number of 6 to 150, preferably 7 to 100, more preferably 10 to 30, more preferably 12 to 25; and/or
13. a kinematic viscosity ("KV") of 2 centi Stokes (cSt) or less at 100 °C, preferably 1.5 cSt or less, preferably 1.0 cSt or less, preferably 0.5 cSt or less, as determined according to ASTM D 445; and/or
14. a glass transition temperature (Tg) according to ASTM E 1356 of less than 30°C preferably less than 20°C, more preferably less than 10°C, more preferably less than 0°C, more preferably less than -5°C, more preferably less than -10°C, more preferably less than -15°C, still more preferably a Tg that cannot be determined according to ASTM E 1356.

[0045] n-Paraffins

[0046] NFPs useful herein may comprise or consist essentially of linear or normal paraffins (n-paraffins). Preferred n-paraffins comprise at least 50 weight%, preferably at least 60 wt%, preferably at least 70 wt%, preferably at least 80 wt%, preferably at least 90 wt%, preferably at least 95 wt% preferably essentially 100 wt% of C₅ to C₂₅ n-paraffins, more preferably C₅ to C₂₀ n-paraffins, more preferably C₅ to C₁₅ n-paraffins. Preferred n-paraffins may also comprise less than 0.1%, preferably less than 0.01% aromatics. In a preferred embodiment, the n-paraffins may have: a KV of 2 cSt or less at 100 °C; and/or a distillation range of 30°C or less, preferably 20°C or less; and/or an initial boiling point greater than 150°C, preferably greater than 200°C; and/or a specific gravity of 0.65 to 0.85, more preferably 0.70 to 0.80, more preferably 0.75 to 0.80; and/or a flash point greater than 60°C, more preferably greater than 90°C, more preferably greater than 100°C, still more preferably greater than 120°C.

[0047] Examples of suitable n-paraffins are commercially available under the tradename NORPAR (ExxonMobil Chemical Company, Houston TX), and are sold commercially as NORPAR series of n-paraffins, examples of which are summarized in Table 1a.

Table 1a. NORPAR Series n-paraffins

Name	distillation range (°C)	pour point (°C)	Avg. Specific Gravity)	Viscosity @ 25°C (cSt)	saturates and aromatics (wt%)
NORPAR 12	189-218		0.75	1.6	<0.01
NORPAR 13	222-242		0.76	2.4	<0.01
NORPAR 14	241-251		0.77	2.8	<0.01
NORPAR 15	249-274	7	0.77	3.3	<0.01

[0048] Isoparaffins

[0049] The NFP useful herein may comprise or consist essentially of branched paraffin, also referred to as isoparaffin. By isoparaffin it is meant that a paraffin chain possess C₁ to C₁₀ alkyl branching along at least a portion of the paraffin chain. More particularly, the isoparaffins are saturated aliphatic hydrocarbons whose molecules have at least one carbon atom bonded to at least three other carbon atoms or at least one side chain (i.e., a molecule having one or more tertiary or quaternary carbon atoms), and preferably wherein the total number of carbon atoms per molecule is in the range between 6 to 50, more preferably between 10 and 24, still more preferably from 10 to 15. Various isomers of each carbon number may be present. Suitable isoparaffins for use as NFP's may also include cycloparaffins having branched side chains. Cycloparaffins may also exist as a minor component of a particular isoparaffin.

[0050] The NFP may comprise at least 50 wt%, preferably at least 60 wt%, preferably at least 70 wt%, preferably at least 80 wt%, preferably at least 90 wt%, preferably at least 95 wt% preferably essentially 100 wt% of C₆ to C₁₅₀ isoparaffins. More preferably, the NFP comprises C₆ to C₁₀₀ isoparaffins, more preferably C₆ to C₂₅ isoparaffins, more preferably C₈ to C₂₀ isoparaffins.

[0051] Preferred isoparaffins may have: a density of 0.70 to 0.83 g/cm³; and/or a pour point of -40°C or less, preferably -50°C or less; and/or a viscosity (ASTM 445, 25°C) of 0.5 to 20 cSt at 25°C; and/or a weight average molecular weight (Mw) of 100 to 300 g/mol determined by GPC.

[0052] The isoparaffins may include greater than 50 wt% (by total weight of the isoparaffin) mono-methyl species, for example, 2-methyl, 3-methyl, 4-methyl, 5-methyl or the like, with minimum formation of branches with substituent groups of carbon number greater than 1, (e.g., ethyl, propyl, butyl and the like), based on the total weight of isoparaffins in the NFP. In one embodiment, the isoparaffin includes greater than 70 wt% mono-methyl species, based on the total weight of the isoparaffin present.

[0053] Preferably, the isoparaffin has a boiling point of from 100°C to 350°C, more preferably 110°C to 320°C. In preparing different grades of isoparaffin, a paraffinic mixture may be fractionated into cuts having narrow boiling ranges, for example, of about 35°C.

[0054] Suitable isoparaffins are commercially available under the tradename ISOPAR[®] (ExxonMobil Chemical Company, Houston TX), and are described in, for example, United States Patent Nos. 6,197,285 (column 5, lines 1-18), 3,818,105 and 3,439,088, and sold commercially as ISOPAR[®] series of isoparaffins, examples of which are summarized in Table 1b.

Table 1b. ISOPAR[®] Series Isoparaffins

Name	distillation range (°C)	pour point (°C)	Avg. Specific Gravity	Viscosity @ 25°C (cSt)	saturates and aromatics (wt%)
ISOPAR E	117-136	-63	0.72	0.85	<0.01
ISOPAR G	161-176	-57	0.75	1.46	<0.01
ISOPAR H	178-188	-63	0.76	1.8	<0.01
ISOPAR K	179-196	-60	0.76	1.85	<0.01
ISOPAR L	188-207	-57	0.77	1.99	<0.01
ISOPAR M	223-254	-57	0.79	3.8	<0.01
ISOPAR V	272-311	-63	0.82	14.8	<0.01

[0055] Other suitable isoparaffins for use as NFPs are commercially available under the trade names SHELLSOL (by Shell Chemical Co.), SOLTROL[®] (by Chevron Phillips) and SASOL[®] (by Sasol Limited). SHELLSOL is a product of the Royal Dutch/Shell Group of Companies, for example Shellsol[™] (boiling point = 215-260°C). SOLTROL[®] is a product of

Chevron Phillips Chemical Co. LP, for example SOLTROL[®] 220 (boiling point = 233-280°C). SASOL[®] is a product of Sasol Limited (Johannesburg, South Africa), for example SASOL[®] LPA-210, SASOL-47 (boiling point = 238-274°C).

[0056] Paraffin Blends

[0057] In another embodiment, the NFP may comprise paraffin blends comprising a mixture or blend of two or more cyclic, branched, or normal paraffins. Preferred blends have a KV of 2 cSt or less at 100°C. Paraffins in the blends preferably comprise from 6 to 50 carbon atoms, more preferably 10 to 24 carbon atoms. The paraffin blends may have a branch paraffin to n-paraffin molar ratio (moles branched paraffin : moles n-paraffin) of 0.5:1 to 9:1, preferably 1:1 to 4:1, based on the total moles of paraffin present in the blend.

[0058] The paraffin blend may include isoparaffins having greater than 50 wt% (by total weight of the blend) mono-methyl species, for example, 2-methyl, 3-methyl, 4-methyl, 5-methyl or the like, with minimum formation (i.e., less than 10 wt%) of branches with substituent groups of carbon number greater than 1, (e.g., ethyl, propyl, butyl and the like), based on the total weight of isoparaffins in the NFP. In one embodiment, the isoparaffins of the composition contain greater than 70wt% of the mono-methyl species, based on the total weight of the isoparaffins present in the mixture or blend. Preferably, the paraffin blend has a boiling point of 100°C to 350°C, more preferably 110°C to 320°C.

[0059] Dearomatized Aliphatic Hydrocarbon

[0060] In an embodiment, the NFP may comprise or consist essentially of a dearomatized aliphatic hydrocarbon, which may comprise normal paraffins, isoparaffins and/or cycloparaffins. Preferred dearomatized aliphatic hydrocarbons have a KV of 2 cSt or less at 100°C, and preferably comprise at least 50 wt%, preferably at least 60 wt%, preferably at least 70 wt%, preferably at least 80 wt%, preferably at least 90 wt%, preferably at least 95 wt% preferably essentially 100 wt% of dearomatized aliphatic hydrocarbon.

[0061] Preferred dearomatized aliphatic hydrocarbons may include a mixture of C₄ to C₂₅ normal paraffins, isoparaffins and cycloparaffins, more preferably C₅ to C₁₈, still more preferably C₅ to C₁₂. Preferred dearomatized aliphatic hydrocarbons may contain less than 0.1 wt%, preferably less than 0.01 wt% aromatics, based on the total weight of the dearomatized aliphatic hydrocarbon.

[0062] In a preferred embodiment the dearomatized aliphatic hydrocarbon may have: a distillation range of 30°C or less, preferably 20°C or less; and/or an initial boiling point greater than 50°C, preferably greater than 100°C, preferably greater than 200°C; and/or a specific gravity (15.6°C) of 0.65 to 0.85, more preferably 0.70 to 0.85, more preferably 0.75 to 0.85, still more preferably 0.80 to 0.85; and/or a flash point greater than 60°C, more preferably greater than 90°C, more preferably greater than 100°C, still more preferably greater than 110°C.

[0063] Suitable dearomatized aliphatic hydrocarbons are commercially available under the tradename EXXSOL[®] (ExxonMobil Chemical Company, Houston TX), and are sold commercially as EXXSOL[®] series of dearomatized aliphatic hydrocarbons, some of which are summarized in Table 1c.

Table 1c EXXSOL [®] Series					
Name	distillation range (°C)	Pour point (°C)	Avg. Specific Gravity	Viscosity @ 25°C (cSt)	saturates and aromatics (wt%)
EXXSOL isopentane			0.63	0.3	-
EXXSOL methylpentane	59-62		0.66	0.5	-
naphtha					
EXXSOL hexane fluid	66-69		0.67	0.5	-
EXXSOL DSP 75/100	78-99		0.72	0.6	-
EXXSOL heptane fluid	94-99		0.70	0.6	-
EXXSOL DSP 90/120	98-115		0.74		
Naphtha					
EXXSOL DSP 115/145	116-145		0.75	0.8	-
Naphtha					
EXXSOL D Naphtha	158-178		0.77	1.2	-
EXXSOL D 40	161-202		0.79	1.4	0.3
EXXSOL D 60	188-210		0.80		0.4
EXXSOL D 80	208-234		0.80	2.2	0.4
EXXSOL D 95	224-238		0.80	2.1	0.7
EXXSOL D 110	249-268		0.81	3.5	0.8
EXXSOL D 130	282-311	-45	0.83	6.9	1.5

[0064] Process Oils

[0065] In another embodiment, typical process oils (also called mineral oils) may be used as plasticizers herein. Characteristics of some commercially available mineral oils used as process oils are listed in Table 1d. Such fluids typically have a viscosity index less than 120, most have a viscosity index less than 110, and many have a viscosity index of 100 or less.

Table 1d Commercial Examples of Process Oils

Grade	KV @ 100°C, cSt	VI	Pour Point, °C	Specific gravity	Flash Point, °C	APHA Color
Drakeol [®] 34 ¹	9	99	-12	0.872	254	10
Paralux [®] 1001R ²	4	99	-17	0.849	212	25
Paralux [®] 2401R ²	6	101	-12	0.863	234	45
Paralux [®] 6001R ²	12	102	-21	0.871	274	45
Sunpar [®] 120 ³	6	106	-15	0.872	228	> 200
Sunpar [®] 150 ³	11	97	-9	0.881	245	> 300
Sunpar [®] 2280 ³	31	95	-9	0.899	305	> 300
Plastol 135 ⁴	5	104	-9	0.865	210	10
Plastol 537 ⁴	11	97	-3	0.880	240	10
Plastol 2105 ⁴	30	110	-15	0.885	270	10
Flexon [®] 843 ⁴	5	91	-12	0.869	218	> 250
Flexon [®] 865 ⁴	11	93	-3	0.879	252	> 250
Flexon [®] 815 ⁴	32	101	-9	0.895	310	> 300
Shellflex [®] 210 ⁵	4	95	-18	0.860	216	> 200
Shellflex [®] 330 ⁵	9	95	-10	0.875	256	> 250
Shellflex [®] 810 ⁵	33	95	-9	0.896	324	> 300

¹ Available commercially from Penreco.

² Available commercially from ChevronTexaco.

³ Available commercially from Sunoco.

⁴ Available commercially from ExxonMobil.

⁵ Available commercially from Shell.

[0066] Other examples of useful plasticizers include processing oils produced using an all-hydroprocessing route which transforms the molecular structure of undesirable aromatics into highly desirable saturates to produce a process oil with particular physical and chemical properties including low aromatic content, low volatility, and ease of processability. Such oils are

available commercially under the tradename Paralux[®] processing oils, which are available from ChevronTexaco Global Lubricants, San Ramon, CA. Properties of some of the available Paralux[®] oils are summarized in Table 1e below.

Table 1e Paralux[®] Series

Physical Properties	ASTM Method	Paralux 701R	Paralux 1001R	Paralux 2401R	Paralux 6001R
Viscosity at: 40°C, cst	D445	12.1	20.0	43.3	117.6
Viscosity at: 100°C, cst	D445	2.9	4.1	6.5	12.5
Viscosity index	D2270	80	99	101	102
Specific gravity 60°F	D4052	0.8509	0.853	0.8665	0.8747
Density at 20°C g/cc	D4052	0.8517	0.8493	0.8632	0.8712
Molecular weight	D2502	318	360	430	582
Pour point, °C	D97	-40	-17	-12	-21
Clay – gel mass %	D2007				
Asphaltenes		0.0	0.0	0.0	0.0
Polar compounds		0.1	0.1	0.1	0.1
Aromatics		0.3	0.5	1.3	3.1
Total aromatics		0.3	0.5	1.3	3.1
Saturates		99.6	99.4	98.6	96.8
Carbon type by ndM	D3238				
% Carbon in paraffinic structure		61	68	66	70
% Carbon in naphthenic structure		39	32	34	30
% Carbon in aromatic structure		0	0	<0.3	0
Carbon type analysis, %	D2140				
Ca		<1	<1	<1	<1
Cn		37	32	34	31
Cp		63	68	66	69
Aromatics by HPLC	Chevron	<1	<1	<1	<1
Saturates by HPLC	Chevron	>99	>99	>99	>99

[0067] High Purity Hydrocarbon Fluids

[0068] The NFP useful in the present invention may comprise or consist essentially of a “high purity” hydrocarbon fluid, preferably comprising one or more paraffins having 6 to 1500 carbon atoms, preferably 8 to 1000 carbon atoms, preferably 10 to 500 carbon atoms, preferably 12 to about 200 carbon atoms, preferably 14 to 150 carbon atoms, preferably 16 to 100 carbon atoms, preferably 20 to 500 carbon atoms, preferably 30 to 400 carbon atoms, preferably 40 to 200 carbon atoms, preferably 20 to 100 carbon atoms. The high purity

hydrocarbon fluid composition may have an isoparaffin : n-paraffin ratio of about 0.5:1 to about 9: 1, preferably about 1:1 to about 4:1. The isoparaffins of the "high purity" hydrocarbon fluid composition may contain greater than fifty percent mono-methyl species, e.g., 2-methyl, 3-methyl, 4-methyl, ≥ 5 -methyl or the like, with minimum formation of branches with substituent groups of carbon number greater than 1, i.e., ethyl, propyl, butyl or the like, based on the total weight of isoparaffins in the mixture. Preferably, the isoparaffins of the "high purity" hydrocarbon fluid composition contain greater than 70 percent of the mono-methyl species, based on the total weight of the composition.

[0069] A preferred high purity hydrocarbon fluid may have: a KV at 25°C of 1 to 100,000 cSt, preferably 10 cSt to 2000 cSt; and/or a KV at 40°C of 1 to 30,000 cSt, preferably 10 cSt to 2000 cSt; and/or a pour point below -10°C, preferably below -20°C, more preferably below -30°C, more preferably from about -20°C to about -70°C.

[0070] In a preferred embodiment, a high purity hydrocarbon fluid may comprise paraffins having: a number average molecular weight of 500 to 21,000 g/mol; and/or less than 10% side chains having 4 or more carbons, preferably less than 8 wt%, preferably less than 5 wt%, preferably less than 3 wt%, preferably less than 2 wt%, preferably less than 1 wt%, preferably less than 0.5 wt%, preferably less than 0.1 wt%, preferably at less than 0.1 wt%, preferably at 0.001 wt%; and/or at least 1 or 2 carbon branches present at 15 wt% or more, preferably 20 wt% or more, preferably 25 wt% or more, preferably 30 wt% or more, preferably 35 wt% or more, preferably 40 wt% or more, preferably 45 wt% or more, preferably 50 wt% or more; and/or less than 2.5 wt% cyclic paraffins, preferably less than 2 wt%, preferably less than 1 wt%, preferably less than 0.5 wt%, preferably less than 0.1 wt%, preferably at less than 0.1 wt%, preferably at 0.001 wt%.

[0071] In another preferred embodiment, a high purity hydrocarbon fluid may comprise paraffins having: a KV of 2 cSt or more at 100°C; and/or a viscosity index of 120 or more, preferably 130 or more, preferably 140 or more,

preferably 150 or more, preferably 170 or more, preferably 190 or more, preferably 200 or more, preferably 250 or more, preferably 300 or more; and/or a mixture of paraffins of carbon number ranging from about C₈ to C₂₀, preferably from about C₈ to C₅₀₀; and/or a molar ratio of isoparaffins to n-paraffins of about 0.5:1 to about 9:1; and/or greater than 50 % of mono-methyl species, based on the total weight of the isoparaffins; and/or a pour point of about -20°F to about -70°F, preferably -10 to -70°C; and/or a kinematic viscosity at 25°C of about 1 cSt to about 10 cSt; and/or a kinematic viscosity at 100°C of about 3 to about 25 cSt; and/or a carbon number of C₁₀ to about C₁₆, preferably of about C₂₀ to about C₁₀₀; and/or greater than 70 percent mono-methyl species; and/or a boiling temperature of about 320°F to about 650°F, more preferably of about 350°F to about 550°F.

[0072] In a preferred embodiment, the high purity hydrocarbon fluid comprises a mixture of paraffins having a carbon number of C₁₀ to about C₁₆, preferably of about C₂₀ to about C₁₀₀; contains greater than 70 percent mono-methyl species; has a boiling temperature of about 350°F to about 550°F, and has a molar ratio of isoparaffins to n-paraffins of about 1:1 to about 4:1.

[0073] The high purity hydrocarbon fluid may also be derived from a Fischer-Tropsch process followed by a wax isomerization process, such as those disclosed in United States Patent No. 5,906,727.

[0074] In another embodiment, the NFP is a high purity hydrocarbon fluid of lubricating viscosity comprising a mixture of C₂₀ to C₁₂₀ paraffins, 50 wt% or more being isoparaffinic hydrocarbons and less than 50 wt% being hydrocarbons that contain naphthenic and/or aromatic structures. Preferably, the mixture of paraffins comprises a wax isomerate lubricant base stock or oil, which includes:

1. hydroisomerized natural and refined waxes, such as slack waxes, deoiled waxes, normal alpha-olefin waxes, microcrystalline waxes, and waxy stocks derived from gas oils, fuels hydrocracker bottoms,

hydrocarbon raffinates, hydrocracked hydrocarbons, lubricating oils, mineral oils, polyalphaolefins, or other linear or branched hydrocarbon compounds with carbon number of about 20 or more; and

2. hydroisomerized synthetic waxes, such as Fischer-Tropsch waxes (i.e., the high boiling point residues of Fischer-Tropsch synthesis, including waxy hydrocarbons); or mixtures thereof.

[0075] Particularly preferred are lubricant base stocks or oils derived from hydrocarbons synthesized in a Fischer-Tropsch process as part of an overall Gas-to-Liquids (GTL) process.

[0076] In one embodiment, the mixture of paraffins useful as an NFP has:

1. a naphthenic content of less than 40 wt%, preferably less than 30 wt%, preferably less than 20 wt%, preferably less than 15 wt%, preferably less than 10 wt%, preferably less than 5 wt%, preferably less than 2 wt%, preferably less than 1 wt% (based on the total weight of the hydrocarbon mixture); and/or
2. a normal paraffins content of less than 5 wt%, preferably less than 4 wt%, preferably less than 3 wt%, preferably less than 1 wt% (based on the total weight of the hydrocarbon mixture); and/or
3. an aromatic content of 1 wt% or less, preferably 0.5 wt% or less; and/or
4. a saturates level of 90 wt% or higher, preferably 95 wt% or higher, preferably 98 wt% or higher, preferably 99 wt% or higher; and/or
5. the percentage of carbons in chain-type paraffinic structures (CP) of 80% or more, preferably 90% or more, preferably 95% or more, preferably 98% or more; and/or
6. a branched paraffin:normal paraffin ratio greater than about 10:1, preferably greater than 20:1, preferably greater than 50:1, preferably greater than 100:1, preferably greater than 500:1, preferably greater than 1000:1; and/or
7. sidechains with 4 or more carbons making up less than 10% of all sidechains, preferably less than 5%, preferably less than 1%; and/or

8. sidechains with 1 or 2 carbons making up at least 50% of all sidechains, preferably at least 60%, preferably at least 70%, preferably at least 80%, preferably at least 90%, preferably at least 95%, preferably at least 98%; and/or
9. a sulfur content of 300 ppm or less, preferably 100 ppm or less, preferably 50 ppm or less, preferably 10 ppm or less (where ppm is on a weight basis); and/or
10. a nitrogen content of 300 ppm or less, preferably 100 ppm or less, preferably 50 ppm or less, preferably 10 ppm or less (where ppm is on a weight basis).

[0077] In another embodiment, the mixture of paraffins useful as NFP's herein has:

1. a number-average molecular weight of 300 to 1800 g/mol, preferably 400 to 1500 g/mol, preferably 500 to 1200 g/mol, preferably 600 to 900 g/mol; and/or
2. a kinematic viscosity at 40°C of 10 cSt or more, preferably 25 cSt or more, preferably between about 50 and 400 cSt; and/or
3. a kinematic viscosity at 100°C ranging from 2 to 50 cSt, preferably 3 to 30 cSt, preferably 5 to 25 cSt, preferably 6 to 20 cSt, more preferably 8 to 16 cSt; and/or
4. a viscosity index ("VI") of 80 or greater, preferably 100 or greater, preferably 120 or greater, preferably 130 or greater, preferably 140 or greater, preferably 150 or greater, preferably 160 or greater, preferably 180 or greater; and/or
5. a pour point of -5°C or lower, preferably -10°C or lower, preferably -15°C or lower, preferably -20°C or lower, preferably -25°C or lower, preferably -30°C or lower; and/or
6. a flash point of 200°C or more, preferably 220°C or more, preferably 240°C or more, preferably 260°C or more; and/or
7. a specific gravity (15.6°C/15.6°C) of 0.86 or less, preferably 0.85 or less, preferably 0.84 or less; and/or

8. an aniline point of 120°C or more; and/or
9. a bromine number of 1 or less.

[0078] In a preferred embodiment, the mixture of paraffins comprises a GTL base stock or oil. GTL base stocks and oils are fluids of lubricating viscosity that are generally derived from waxy synthesized hydrocarbons, that are themselves derived via one or more synthesis, combination, transformation, and/or rearrangement processes from gaseous carbon-containing compounds and hydrogen-containing compounds as feedstocks, such as: hydrogen, carbon dioxide, carbon monoxide, water, methane, ethane, ethylene, acetylene, propane, propylene, propyne, butane, butylenes, and butynes. Preferably, the feedstock is "syngas" (synthesis gas, essentially CO and H₂) derived from a suitable source, such as natural gas and/or coal. GTL base stocks and oils include wax isomerates, comprising, for example, hydroisomerized synthesized waxes, hydroisomerized Fischer-Tropsch (F-T) waxes (including waxy hydrocarbons and possible analogous oxygenates), or mixtures thereof. GTL base stocks and oils may further comprise other hydroisomerized base stocks and base oils. Particularly preferred GTL base stocks or oils are those comprising mostly hydroisomerized F-T waxes and/or other liquid hydrocarbons obtained by a F-T synthesis process.

[0079] The synthesis of hydrocarbons, including waxy hydrocarbons, by F-T may involve any suitable process known in the art, including those involving a slurry, a fixed-bed, or a fluidized-bed of catalyst particles in a hydrocarbon liquid. The catalyst may be an amorphous catalyst, for example based on a Group VIII metal such as Fe, Ni, Co, Ru, and Re on a suitable inorganic support material, or a crystalline catalyst, for example a zeolitic catalyst. The process of making a lubricant base stock or oil from a waxy stock is characterized as a hydrodewaxing process. A hydrotreating step, while typically not required for F-T waxes, can be performed prior to hydrodewaxing if desired. Some F-T waxes may benefit from removal of oxygenates while others may benefit from oxygenates treatment prior to hydrodewaxing. The hydrodewaxing process is typically conducted over a catalyst or combination of catalysts at high

temperatures and pressures in the presence of hydrogen. The catalyst may be an amorphous catalyst, for example based on Co, Mo, W, etc. on a suitable oxide support material, or a crystalline catalyst, for example a zeolitic catalyst such as ZSM-23 and ZSM-48 and others disclosed in United States Patent No. 4,906,350, often used in conjunction with a Group VIII metal such as Pd or Pt. This process may be followed by a solvent and/or catalytic dewaxing step to lower the pour point of the hydroisomerate. Solvent dewaxing involves the physical fractionation of waxy components from the hydroisomerate. Catalytic dewaxing converts a portion of the hydroisomerate to lower boiling hydrocarbons; it often involves a shape-selective molecular sieve, such as a zeolite or silicoaluminophosphate material, in combination with a catalytic metal component, such as Pt, in a fixed-bed, fluidized-bed, or slurry type process at high temperatures and pressures in the presence of hydrogen.

[0080] Useful catalysts, processes, and compositions for GTL base stocks and oils, Fischer-Tropsch hydrocarbon derived base stocks and oils, and wax isomerate hydroisomerized base stocks and oils are described in, for example, United States Patent Nos. 2,817,693; 4,542,122; 5,545,674; 4,568,663; 4,621,072; 4,663,305; 4,897,178; 4,900,407; 4,921,594; 4,923,588; 4,937,399; 4,975,177; 5,059,299; 5,158,671; 5,182,248; 5,200,382; 5,290,426; 5,516,740; 5,580,442; 5,885,438; 5,935,416; 5,935,417; 5,965,475; 5,976,351; 5,977,425; 6,025,305; 6,080,301; 6,090,989; 6,096,940; 6,103,099; 6,165,949; 6,190,532; 6,332,974; 6,375,830; 6,383,366; 6,475,960; 6,620,312; and 6,676,827; European Patent Nos. EP 324528, EP 532116, EP 532118, EP 537815, EP 583836, EP 666894, EP 668342, EP 776959; WPO Patent Application Publication Nos. WO 97/31693, WO 99/20720, WO 99/45085, WO 02/64710, WO 02/64711, WO 02/70627, WO 02/70629, WO 03/33320; and United Kingdom Patent Nos. 1,350,257; 1,390,359; 1,429,494; and 1,440,230. Particularly favorable processes are described in European Patent Application Publication Nos. EP 464546 and EP 464547. Processes using Fischer-Tropsch wax feeds are described in United States Patent Nos. 4,594,172; 4,943,672; 6,046,940; 6,103,099; 6,332,974; 6,375,830; and 6,475,960.

[0081] Desirable GTL-derived fluids are broadly available from several commercial sources, including Chevron, ConocoPhillips, ExxonMobil, Sasol, SasolChevron, Shell, Statoil, and Syntroleum.

[0082] This invention also relates to compositions where one or more NFP is a high purity hydrocarbon fluid derived from a GTL process comprising a mixture of paraffins of carbon number ranging from about C₂₀ to C₁₀₀, a molar ratio of isoparaffins:n-paraffins greater than about 50:1, the percentage of carbons in paraffinic structures (C_p) of 98% or more, a pour point ranging from about -20 to -60°C, and a kinematic viscosity at 100°C ranging from about 6 to 20 cSt.

[0083] As used herein, the following terms have the indicated meanings: “naphthenic” describes cyclic (mono-ring and/or multi-ring) saturated hydrocarbons (i.e., cycloparaffins) and branched cyclic saturated hydrocarbons; “aromatic” describes cyclic (mono-ring and/or multi-ring) unsaturated hydrocarbons and branched cyclic unsaturated hydrocarbons; “hydroisomerized” describes a catalytic process in which normal paraffins and/or slightly branched isoparaffins are converted by rearrangement into more branched isoparaffins (also known as “isodewaxing”); “wax” is a hydrocarbonaceous material existing as a solid at or near room temperature, with a melting point of 0°C or above, and consisting predominantly of paraffinic molecules, most of which are normal paraffins; “slack wax” is the wax recovered from petroleum oils such as by solvent dewaxing, and may be further hydrotreated to remove heteroatoms

[0084] Polyalpha olefins (PAOs)

[0085] Preferred NFP's useful as plasticizers herein comprise or consist essentially of a Polyalpha-Olefin (PAO), comprising oligomers or low molecular weight polymers of branched and/or linear alpha olefins. PAOs useful as plasticizers in the present invention may comprise C₂₀ to C₁₅₀₀ paraffins, preferably C₃₀ to C₁₀₀₀ paraffins, preferably C₄₀ to C₁₀₀₀ paraffins, preferably C₅₀ to C₇₅₀ paraffins, preferably C₃₀ to C₅₀₀ paraffins, preferably C₄₀ to C₅₀₀ paraffins,

preferably C₅₀ to C₅₀₀ paraffins. Preferred PAO's comprise linear alpha olefins having 5 to 18 carbon atoms, preferably 5 to 16 carbon atoms, more preferably 5 to 14 carbon atoms, more preferably 6 to 12 carbon atoms, more preferably 8 to 12 carbon atoms, still more preferably an average of about 10 carbon atoms.

[0086] In an embodiment, PAO's may include dimers, trimers, tetramers, pentamers, and the like of C₅ to C₂₄ α -olefins, preferably C₅ to C₁₈ α -olefins, preferably C₅ to C₁₆ α -olefins, preferably C₅ to C₁₄ α -olefins, preferably C₆ to C₁₂ α -olefins, more preferably C₈ to C₁₂ α -olefins. Suitable α -olefins includes 1-pentene, 1-hexene, 1-heptene, 1-octene, 1-nonene, 1-decene, 1-undecene and/or 1-dodecene.

[0087] In a preferred embodiment, the alpha olefin is 1-decene, and the NFP includes a mixture of oligomers of 1-decene (e.g., dimers, trimers, tetramers and pentamers and higher). Preferred PAO's are described more particularly in, for example, United States Patent Nos. 5,171,908, and 5,783,531 and in SYNTHETIC LUBRICANTS AND HIGH-PERFORMANCE FUNCTIONAL FLUIDS 1-52 (Leslie R. Rudnick & Ronald L. Shubkin, ed. Marcel Dekker, Inc. 1999).

[0088] In another preferred embodiment, PAO's may include oligomers of two or more C₅ to C₂₄ α -olefins, preferably two or more C₅ to C₁₈ α -olefins, preferably two or more C₅ to C₁₆ α -olefins, preferably two or more C₅ to C₁₄ α -olefins, preferably two or more C₆ to C₁₂ α -olefins, preferably two or more C₈ to C₁₂ α -olefins.

[0089] Preferred PAO's may also have:

a KV at 100°C of 4 cSt or more, preferably 5 cSt or more, preferably 6 cSt or more, preferably 8 cSt or more, preferably 10 cSt or more, more preferably 20 cSt or more, more preferably 30 cSt or more, more preferably 40 cSt or more, preferably 50 cSt or more, preferably 80 cSt or more, preferably 100 cSt or more, preferably 110 or more, preferably 150 cSt or more, preferably 200 cSt or more, preferably 300 cSt or more, preferably 500 cSt or more, preferably 750 or more, preferably

1000 cSt or more, preferably 1500 cSt or more, preferably 2000 cSt or more, still more preferably 2500 or more, preferably 10 cSt to 3000 cSt, preferably 10 cSt to 1000 cSt, still more preferably 10 cSt to 40 cSt; a kinematic viscosity at 100°C of 0.1 to 3000 cSt, more preferably 0.5 to 1000 cSt, more preferably 1 to 250 cSt, more preferably 1 to 200 cSt, more preferably 4 to 500 cSt, more preferably 6 to 300 cSt, more preferably 10 to 500 cSt, more preferably 0.1 to 150 cSt, still more preferably less than 2 cSt; and/or

a viscosity index of 90 or more, more preferably 100 or more, more preferably 105 or more, more preferably 110 or more, more preferably 115 or more, more preferably 120 or more, more preferably 125 or more, more preferably 130 or more, more preferably 140 or more, more preferably 150 or more, more preferably 190 or more, more preferably 200 or more, more preferably 250 or more, still more preferably 300 or more, more preferably 90 to 400, still more preferably 120 to 350; and/or

a number average molecular weight (M_n) of 100 to 21,000, more preferably 300 to 15,000, more preferably 200 to 10,000, more preferably 200 to 7,000, more preferably 600 to 3,000, more preferably 200 to 2,000, still more preferably 200 to 500 g/mole; and/or

a weight average molecular weight M_w of less than 20,000 g/mol, more preferably less than 10,000 g/mol, more preferably less than 5,000 g/mol, more preferably less than 4,000 g/mol, more preferably less than 2,000 g/mol, more preferably less than 500 g/mol, more preferably less than 100 g/mol; and/or

a pour point of less than 0°C, more preferably -5°C or less, more preferably -10°C or less, more preferably -20°C or less, still more preferably less than -40°C; and/or

a dielectric constant at 20°C of less than 3.0, preferably less than 2.8, more preferably less than 2.5, more preferably less than 2.3, still more preferably less than 2.1; and/or

a specific gravity (ASTM D 4052, 15.6/15.6°C) of less than 0.920, more preferably less than 0.910, more preferably less than 0.86, more preferably less than 0.855, more preferably less than 0.85, more preferably 0.650 to 0.900, more preferably 0.700 to 0.860, more preferably 0.750 to 0.855, more preferably 0.790 to 0.850, more preferably 0.800 to 0.840; and/or
a boiling point of 100°C to 500°C, more preferably 200°C to 450°C, still more preferably 250 °C to 400°C.

[0090] In a preferred embodiment, the NFP is a PAO comprising C₆ to C₁₄ olefins having a kinematic viscosity of 10 cSt or more at 100°C, and a viscosity index of 120 or more, preferably 130 or more, as determined by ASTM D-2270.

[0091] Particularly preferred PAO's for use here in are those having a flash point of 200°C or more, preferably 220°C, ore more, preferably 230°C or more, preferably 240°C or more, preferably 250°C or more.

[0092] Particularly preferred PAO's for use here in are those having a flash point of 200°C or more (preferably 220°C, or more, preferably 230°C or more, preferably 250°C or more) and a pour point less than -25°C (preferably less than -30°C, preferably less than -35°C, preferably less than -40°C), or a kinematic viscosity at 100°C of 35cSt or more (preferably 40cSt or more, preferably 50cSt or more, preferably 60cSt or more).

[0093] Desirable PAO's are commercially available under the tradename SHF, SuperSyn, and SpectraSyn[®] PAO's (ExxonMobil Chemical Company, Houston), some of which are summarized in the Table 2 below.

Table 2. SHF, SuperSyn and Spectrasyn Series Polyalphaolefins

PAO	specific gravity (15.6/15.6°C)	Viscosity @ 100°C, cSt	VI	Pour Point, °C
SHF-20	0.798	1.68	-	-63
SHF-21	0.800	1.70	-	-57
SHF-23	0.802	1.80	-	-54
SHF-41	0.818	4.00	123	-57
SHF-61/63	0.826	5.80	133	-57
SHF-82/83	0.833	7.90	135	-54
SHF-101	0.835	10.0	136	-54
SHF-403	0.850	40.0	152	-39
SHF-1003	0.855	107	179	-33
SuperSyn 2150	0.850	150	214	-42
SuperSyn 2300	0.852	300	235	-30
SuperSyn 21000	0.856	1,000	305	-18
SuperSyn 23000	0.857	3,000	388	-9
SpectraSyn® 2	0.798	1.7	-	-66
SpectraSyn® 2B	0.799	1.8	-	-54
SpectraSyn® 4	0.820	4.1	126	-66
SpectraSyn® 5	0.824	5.1	138	-57
SpectraSyn® 6	0.827	5.8	138	-57
SpectraSyn® 8	0.833	8	139	-48
SpectraSyn® 10	0.835	10	137	-48
SpectraSyn® 40	0.850	40	147	-36
SpectraSyn® 100	0.855	100	170	-30
SpectraSyn®	0.850	150	218	-33
Ultra 150				
SpectraSyn®	0.852	300	241	-27
Ultra 300				
SpectraSyn®	0.856	1000	307	-18
Ultra 1000				

[0094] Other useful PAO's include those sold under the tradenames Synfluid® available from ChevronPhillips Chemical Co. in Pasadena Texas, Durasyn® available from BP Amoco Chemicals in London England, Nexbase® available from Fortum Oil and Gas in Finland, Synton® available from Crompton Corporation in Middlebury CT, USA, EMERY™ available from Cognis Corporation in Ohio, USA.

[0095] Polybutene

[0096] Polybutenes may be useful as plasticizers in the present invention. Suitable polybutenes, also referred to herein as polybutene processing oils, include homopolymers or copolymers of olefin derived units having from 3 to 8 carbon atoms, preferably from 4 to 6 carbon atoms, more preferably 4 carbon atoms. In a preferred embodiment, the polybutene is a homopolymer or copolymer of a C₄ raffinate. Examples of suitable polybutene polymers are described in, for example, SYNTHETIC LUBRICANTS AND HIGH-PERFORMANCE FUNCTIONAL FLUIDS 357-392 (Leslie R. Rudnick & Ronald L. Shubkin, ed., Marcel Dekker 1999)

[0097] Suitable polybutenes may include a copolymer comprising isobutylene derived units, 1-butene derived units, and/or 2-butene derived units. Preferred polybutenes include homopolymers, copolymers, and/or terpolymer of the three units or more. Preferred polybutenes include those in which isobutylene derived units comprise 40 to 100 wt%, preferably 40 to 99 wt%, more preferably 40 to 96 wt% of the polymer; and/or the 1-butene derived units comprise 0 to 40 wt%, preferably 2 to 40 wt% of the copolymer; and/or the 2-butene derived units comprise 0 to 40 wt%, more preferably 0 to 30 wt%, still more preferably 2 to 20 wt% of the polymer.

[0098] In yet another embodiment, the polybutene is a homopolymer or copolymer of isobutylene and 1-butene, wherein the isobutylene derived units are from 65 to 100 wt% of the homopolymer or copolymer, and the 1-butene derived units are from 0 to 35 wt% of the copolymer.

[0099] Preferred polybutenes may have a Mn of less than 15,000, and a Mw of 60,000 or less. Particularly preferred polybutene processing oils include those having a number average molecular weight (Mn) of less than 10,000 g/mol, more preferably less than 8000 g/mol, still more preferably less than 6000 g/mol; and/or a number average molecular weight Mn of greater than 400 g/mol, preferably greater than 700 g/mol, more preferably greater than 900 g/mol. A

preferred embodiment can be a combination of any lower molecular weight limit with any upper molecular weight limit described herein. For example, in one embodiment of the polybutene of the invention, the polybutene has a number average molecular weight of from 400 g/mol to 10,000 g/mol, and from 700 g/mol to 8000 g/mol in another embodiment, and from 900 g/mol to 3000 g/mol in yet another embodiment.

[00100] Suitable polybutenes may also have a viscosity of greater than 35 cSt at 100°C, preferably greater than 100 cSt at 100°C, more preferably 10 to 6000 cSt at 100°C, still more preferably 35 to 5000 cSt at 100°C.

[00101] Commercial examples of useful polybutenes include the PARAPOL™ Series of processing oils (Infineum, Linden, NJ), such as PARAPOL™ 450, 700, 950, 1300, 2400 and 2500 and the Infineum "C" series of polybutenes, including C9945, C9900, C9907, C9913, C9922, C9925 as listed below. The commercially available PARAPOL™ and Infineum Series of polybutene processing oils are synthetic liquid polybutenes, each individual formulation having a certain molecular weight, all formulations of which can be used in the composition of the invention. The molecular weights of the PARAPOL™ oils are from 420 Mn (PARAPOL™ 450) to 2700 Mn (PARAPOL™ 2500) as determined by gel permeation chromatography. The MWD of the PARAPOL™ oils range from 1.8 to 3 in one embodiment, and from 2 to 2.8 in another embodiment; the pour points of these polybutenes are less than 25°C in one embodiment, less than 0°C in another embodiment, and less than -10°C in yet another embodiment, and between -80°C and 25°C in yet another embodiment; and densities (IP 190/86 at 20°C) range from 0.79 to 0.92 g/cm³, and from 0.81 to 0.90 g/cm³ in another embodiment.

[00102] Below, Tables 3a and 3b show some of the properties of the PARAPOL™ oils and Infineum oils useful in embodiments of the present invention, wherein the viscosity was determined as per ASTM D445-97, and the number average molecular weight (M_n) by gel permeation chromatography.

Table 3a. PARAPOL™ Grades of polybutenes

Grade	M_n	Viscosity @ 100°C, cSt
450	420	10.6
700	700	78
950	950	230
1300	1300	630
2400	2350	3200
2500	2700	4400

Table 3b Infineum Grades of Polybutenes

Grade	M_n	Viscosity @ 100°C, cSt	Viscosity Index
C9945	420	10.6	~75
C9900	540	11.7	~60
C9907	700	78	~95
C9995	950	230	~130
C9913	1300	630	~175
C9922	2225	2500	~230
C9925	2700	4400	~265

[00103] Lubricant Basestocks

[00104] Suitable plasticizers may also include lubricant basestocks, which may be distinguished by their viscosity indices determined according to ASTM D-2270, and an amount of saturates and sulfur they contain. Hydrocarbon basestocks have been classified as Group I, II or III by the American Petroleum Institute (API). Group I basestocks are solvent refined mineral oils. They contain the most unsaturates and sulfur of the three groups, and have the lowest viscosity indices. Group II and Group III basestocks are referred to as High Viscosity Index and Very High Viscosity Index basestocks respectively. They are hydroprocessed mineral oils. The Group III oils contain less unsaturates and sulfur than the Group I oils, and have higher viscosity indices compared to Group II oils.

[00105] In an embodiment, plasticizers may comprise

Group I basestocks, including mineral oils that may have been refined using solvent extraction of aromatics, solvent dewaxing, and hydrofining to reduce sulfur content. Group I basestocks may have

sulfur levels greater than 0.03 wt%, saturates levels of 60 to 80 %, and a viscosity index of about 90 by ASTM D-2270; and/or

Group II basestocks, including mineral oils that have been mildly hydrocracked with conventional solvent extraction of aromatics, solvent dewaxing, and more severe hydrofining to reduce sulfur levels to less than or equal to 0.03 wt%, as well as removing double bonds from some of the olefinic and aromatic compounds such that saturate levels are greater than 95-98% and the viscosity index is about 80-120 by ASTM D-2270; and/or

Group III basestocks, including mineral oils that have been hydrotreated to comprise saturates levels greater than 95%, to virtually 100%, sulfur contents of less than or equal to 0.03 wt% (preferably between 0.001 and 0.01%), and VI is in excess of 120 by ASTM D-2270.

[00106] In another embodiment the plasticizer comprises a Group III hydrocarbon basestock. Preferably the plasticizer comprises a mineral oil having a saturates levels of 90% or more, preferably 92% or more, preferably 94% or more, preferably 96% or more, preferably 98% or more, preferably 99% or more, and sulfur contents less than 0.03%, preferably between 0.001 and 0.01% and a viscosity index of 120 or more, preferably 130 or more.

[00107] In a preferred embodiment any of the plasticizers described above has a flash point of 200°C or more (preferably 220°C, or more, preferably 230°C or more, preferably 250°C or more). In a particularly preferred embodiment any of the plasticizers described above has a flash point of 200°C or more (preferably 220°C, or more, preferably 230°C or more, preferably 250°C or more) and a pour point of -20°C or less (preferably less than -25°C, preferably less than -30°C, preferably less than -35°C, preferably less than -40°C), and/or a kinematic viscosity at 100°C of 35cSt or more (preferably 40cSt or more, preferably 50cSt or more, preferably 60cSt or more).

[00108] In a preferred embodiment any of the plasticizers described above has flash point of 200°C or greater, preferably 220°C or greater, preferably 200 to

350°C, preferably 210 to 300°C, preferably 215 to 290°C, preferably 220 to 280°C, preferably 240 to 280°C, wherein a desirable range may be any combination of any lower limit with any upper limit described herein.

[00109] In a preferred embodiment any of the plasticizers described above has a pour point of -10°C or less, preferably -20°C or less, preferably -30°C or less, preferably -40°C or less, preferably -45°C or less, preferably -50°C or less, preferably -10 to -80°C, preferably -15 to -75°C, preferably -20 to -70°C, preferably -25 to -65°C, wherein a desirable range may be any combination of any lower limit with any upper limit described herein.

[00110] In a preferred embodiment any of the plasticizers described above has a viscosity index (VI) of 100 or more, preferably 110 or more, preferably 120 or more, preferably 120 to 350, preferably 135 to 300, preferably 140 to 250, preferably 150 to 200, wherein a desirable range may be any combination of any lower limit with any upper limit described herein.

[00111] In a preferred embodiment any of the plasticizers described above has a specific gravity of 0.86 or less, preferably 0.855 or less, preferably 0.84 or less, preferably 0.78 to 0.86, preferably 0.80 to 0.85, preferably 0.82 to 0.845, wherein a desirable range may be any combination of any lower limit with any upper limit described herein.

[00112] In a preferred embodiment any of the plasticizers described above has a kinematic viscosity at 100°C (KV100) of 4 cSt or more, preferably 5 cSt or more, preferably 6 to 5000 cSt, preferably 8 to 3000 cSt, preferably 10 to 1000 cSt, preferably 12 to 500 cSt, preferably 15 to 350 cSt, preferably 35 cSt or more, preferably 40 cSt or more, wherein a desirable range may be any combination of any lower limit with any upper limit described herein.

[00113] In a preferred embodiment any of the plasticizers described above has a number-average molecular weight (Mn) of 300 g/mol or more, preferably 500 g/mol or more, preferably 300 to 21,000 g/mol, preferably 300 to 10,000 g/mol, preferably 400 to 5,000 g/mol, preferably 500 to 3,000 g/mol, preferably

less than 1,000 g/mol, wherein a desirable range may be any combination of any lower limit with any upper limit described herein.

[00114] In a preferred embodiment any of the plasticizers described above has a average carbon number (Cn) of 20 to 1500, preferably 20 to 500, preferably 30 to 400, preferably 20 to 300, preferably 40 to 300, preferably less than 200, preferably less than 100, wherein a desirable range may be any combination of any lower limit with any upper limit described herein.

[00115] In a preferred embodiment any of the plasticizers described above has a specific gravity of 0.86 or less (preferably 0.855 or less, preferably 0.85 or less), and one or more of the following:

- a) a VI of 120 or more (preferably 135 or more, preferably 140 or more), and/or
- b) a flash point of 200°C or more (preferably 220°C or more, preferably 240°C or more).

[00116] In a preferred embodiment any of the plasticizers described above has a pour point of -10°C or less (preferably -15°C or less, preferably -20°C or less, preferably -25°C or less), a VI of 120 or more (preferably 135 or more, preferably 140 or more), and optionally a flash point of 200°C or more (preferably 220°C or more, preferably 240°C or more).

[00117] In a preferred embodiment any of the plasticizers described above has a pour point of -20°C or less (preferably -25°C or less, preferably 30°C or less, preferably -40°C or less) and one or more of the following:

- a) a flash point of 200°C or more (preferably 220°C or more, preferably 240°C or more), and/or
- b) a VI of 120 or more (preferably 135 or more, preferably 140 or more), and/or
- c) a KV100 of 4 cSt or more (preferably 6 cSt or more, preferably 8 cSt or more, preferably 10 cSt or more), and/or

- d) a specific gravity of 0.86 or less (preferably 0.855 or less, preferably 0.85 or less).

[00118] In a preferred embodiment any of the plasticizers described above has a KV100 of 4 cSt or more (preferably 5 cSt or more, preferably 6 cSt or more, preferably 8 cSt or more, preferably 10 cSt or more), a specific gravity of 0.86 or less (preferably 0.855 or less, preferably 0.85 cSt or less), and a flash point of 200°C or more (preferably 220°C or more, preferably 240°C or more).

[00119] In a preferred embodiment any of the plasticizers described above has a flash point of 200°C or more (preferably 220°C or more, preferably 240°C or more), a pour point of 10°C or less (preferably 15°C or less, preferably 20°C or less, preferably 25°C or less), a specific gravity of 0.86 or less (preferably 0.855 or less, preferably 0.85 or less), a KV100 of 4 cSt or more (preferably 5 cSt or more, preferably 6 cSt or more, preferably 8 cSt or more, preferably 10 cSt or more), and optionally a VI of 100 or more (preferably 120 or more, preferably 135 or more).

[00120] A preferred embodiment any of the plasticizers described above has a KV100 of 35 cSt or more (preferably 40 or more) and a specific gravity of 0.86 or less (preferably 0.855 or less), and optionally one or more of the following:

- a) a flash point of 200°C or more (preferably 220°C or more, preferably 240°C or more), and/or
- b) a pour point of 10°C or less (preferably 15°C or less, preferably 20°C or less, preferably 25°C or less).

[00121] In a preferred embodiment any of the plasticizers described above has a flash point of 200°C or more (preferably 210°C or more, preferably 220°C or more), a pour point of 10°C or less (preferably 20°C or less, preferably 30°C or less), and a KV100 of 6 cSt or more (preferably 8 cSt or more, preferably 10 cSt or more, preferably 15 cSt or more).

[00122] In a preferred embodiment any of the plasticizers described above has a pour point of 40°C or less (preferably 50°C or less) and a specific gravity of 0.84 or less (preferably 0.83 or less).

[00123] Other Oils

[00124] The polymer concentrate may also comprise oils in addition to the plasticizer including aliphatic naphthenic oils, white oils, and the like. Particularly preferred oils include paraffinic or naphthenic oils such as Primol[®] 352, or Primol[®] 876 available from ExxonMobil Chemical France, S.A. in Paris, France.

[00125] Other Plasticizers

[00126] Other types of plasticizers suitable for use in the polymer concentrate include phthalates, mellitates, adipates, and the like. Examples of suitable plasticizers also include the substituted phthalates, mellitates, adipates, and the like, wherein the substitutions comprise C1 to C20 hydrocarbons. Preferred plasticizers include di-iso-undecyl phthalate ("DIUP"), di-iso-nonylphthalate ("DINP"), dioctylphthalates ("DOP") combinations thereof, and/or derivatives thereof, and/or the like. Examples of suitable plasticizers include those commercially available under the trade name JayFlex[®], available from ExxonMobil, Baytown TX, examples of which are listed in Table 3c.

Table 3c, Other Plasticizers

Tradename	Chemical Name	Specific Gravity 20 / 20 °C	Density @ 20 °C lb/Gal	Viscosity @ 40 °C Cst
Jayflex [®] 77	diisooheptyl phthalate	0.994	8.29	18
Jayflex [®] DHP	dihexyl phthalate	1.007	8.39	15
Jayflex [®] DIDP	diisodecyl phthalate	0.967	8.07	38
Jayflex [®] DIDP-E	diisodecyl phthalate	0.968	8.07	39
Jayflex [®] DINP	diisononyl phthalate	0.974	8.12	33
Jayflex [®] DIOP	diisooctyl phthalate	0.985	8.21	25
Jayflex [®] DTDp	diisotridecyl phthalate	0.955	7.96	86
Jayflex [®] UDP	undecyl dodecyl phthalate	0.957	7.98	70
Jayflex [®] L11P-E	electrical grade di-1-undecyl)	0.954	7.96	29
Jayflex [®] L11P	phthalate di-1-undecyl)	0.955	7.96	28
Jayflex [®] L711P	phthalate di-1-(nonyl, undecyl) phthalate	0.970	8.09	
Jayflex [®] L911P	di-1-nonyl phthalate	0.962	8.02	25
Jayflex [®] L9P	phthalate triisononyl	0.970	8.09	22
Jayflex [®] TINTM	trimellitate triisooctyl	0.978	8.16	129
Jayflex [®] TIOTM	trimellitate	0.990	8.26	92
Jayflex [®] DIDA	diisodecyl adipate	0.919	7.66	13
Jayflex [®] DINA	diisononyl adipate	0.922	7.69	12
Jayflex [®] DIOA	diisooctyl adipate	0.928	7.74	9
Jayflex [®] DTDA	ditridecyl adipate	0.914	7.62	27
Jayflex [®] 210	naphthenic hydrocarabon	0.887	7.40	9.3
Jayflex [®] 215	aliphatic hydrocarbon	0.769	6.41	2.4

[00127] In an embodiment, when heated, the propylene polymer composition of the invention exhibits a high MFR (greater than twice that of the neat propylene polymer) and a low level of non-plasticizer oligomers. By non-plasticizer oligomers is meant oligomers that are not a part of or derived from the plasticizer component of the composition. In other words, when referring to the

low oligomer content of the present invention, it is meant the low content of oligomeric polymers derived from action of the hydroxylamine ester on the neat propylene polymer. Particular embodiments include, but are not limited to, a heat treated propylene polymer composition exhibiting MFR of from 500 to 1000 dg/min and comprising less than 1% non-plasticizer oligomers. In another preferred embodiment, when heated, the propylene polymer composition exhibits a MFR of from 750 to 2000 dg/min and comprises less than 3% non-plasticizer oligomers, more preferably a MFR of from 1000 to 3000 dg/min and comprises less than 5% non-plasticizer oligomers. Oligomer concentration in a propylene polymer composition may be measured using, among other tests known to those of skill in the art, a hexane extractables test (ASTM D5227-01).

[00128] A non-woven fabric according to the current invention, in at least one embodiment, comprises a propylene polymer composition as described above and exhibits a hydrohead to basis weight ratio of at least 2.5 mbar/gsm, preferably at least 3.0 mbar/gsm, more preferably at least 3.5 mbar/gsm and even more preferably at least 4.0 mbar/gsm. The non-woven fabric propylene polymer compound comprises a neat propylene polymer exhibiting a MFR of 50 to 200 dg/min and a hydroxylamine ester compound present in the range of about 0.01% to about 10% by weight. Further, the non-woven fabric propylene polymer compound, when maintained below an activation temperature, exhibits a MFR of not less than that of the neat propylene polymer to about quadruple that of the neat propylene polymer. When heated above the activation temperature, the non-woven fabric propylene polymer compound exhibits a MFR of from about twice that of the neat propylene polymer to about 3500 dg/min.

[00129] In one embodiment of the non-woven fabric, the fabric exhibits a handle of from a lower endpoint of 5, 8, 10, 12, 15, 17, 19 or 20 grams force to an upper endpoint of from 21, 23, 25, 28, 30, 32, 35, 37, 40, 45 or 50 grams force. In another embodiment, non-woven fabrics of the present invention exhibit a handle of from greater than or equal to 5, 10, 12, 15, 17, 19, 20, 21, 22, 23, 24, 25, 28, 30, 35 or 40 grams force.

[00130] In one embodiment of the non-woven fabric, the propylene polymer composition that comprises the non-woven fabric, when heated to the activation temperature for a length of time, exhibits a MFR of from 500 to 1000 dg/min and comprises less than 1% non-plasticizer oligomers; in another embodiment, a MFR of 1000 to 3000 dg/min and comprises less than 5% non-plasticizer oligomers; in yet another embodiment, a MFR of 750 to 2000 dg/min and comprises less than 3% non-plasticizer oligomers. The activation temperature is a temperature at which the hydroxylamine ester compound of the propylene polymer composition is capable of effectuating substantial amounts of propylene polymer chain breaking to achieve a lower melt viscosity polymer. The hydroxylamine ester compound will often exhibit some viscosity breaking ability below the activation temperature. The activation temperature may be, in one embodiment, about 300°C, in another about 280°C, in another about 260°C and in yet another embodiment, about 240°C.

[00131] A process for preparation of propylene polymer blends according to the current invention involves first, mixing a neat propylene polymer, a viscosity breaking agent, namely a hydroxylamine ester compound, and a plasticizer to form a blend. Mixing of the neat propylene polymer, viscosity breaking agent and/or plasticizer may be by any method known in the art for combining thermoplastic polymers and additive materials, for example, melt mixing in an extruder. Examples of extruders that may be used in the present invention are a planetary extruder, single screw extruder, co- or counter rotating multi-screw screw extruder, co-rotating intermeshing extruder or ring extruder. The viscosity breaking agent may be introduced to the propylene polymer as a neat formulation (high concentration, with few or no additional materials), a dilute solution, a master batch (pre-compounded with a polymeric material the same as, similar to or compatible with the neat propylene polymer), or any other form known to one of skill in the art for mixing additives with thermoplastic polymers.

[00132] After mixing, the blend should exhibit a MFR of from not less than that of the neat propylene polymer to quadruple that of the neat propylene polymer. For example, if the neat propylene polymer exhibits a MFR of 75

dg/min before mixing, then the blend of neat propylene polymer and hydroxylamine ester compound would exhibit a MFR of from 75 dg/min to 300 dg/min. In order that the blend exhibit a near-neat polymer melt viscosity (as measured by MFR), the temperature at which the mixing and pelletizing steps occur must be controlled to prevent substantial activation of the hydroxylamine ester viscosity breaking compound. In one embodiment, it is preferred that the mixing and pelletizing steps occur at a temperature not greater than 250°C, in another embodiment not greater than 240°C, in yet another embodiment, not greater than 230°C, and in yet another embodiment, not greater than 220°C. As discussed herein, in theory, the viscosity breaking agent thermally degrades upon heating to form a free radical species that breaks the macromolecular polymeric bonds to create lower molecular weight polymers, resulting in a lower melt viscosity polymer. Therefore, in one embodiment, it is preferred that the mixing and pelletizing steps occur at a temperature below that which substantially thermally degrades the hydroxylamine ester compound used in the present invention.

[00133] Once mixed, the blend is pelletized. In one embodiment, after pelletizing, the blend pellets are heated in a separate fabrication process to activate the viscosity breaking agent and create a high MFR polymer extrudate. In one embodiment, the high MFR polymer extrudate exhibits a MFR of from about 500 dg/min to about 3500 dg/min, or from about 1000 dg/min to about 2500 dg/min, or from about 1500 dg/min to about 2000 dg/min. In another embodiment, the high MFR polymer extrudate comprises less than 7.5% non-plasticizer oligomers by weight, preferably less than 5%, more preferably less than 3%, even more preferably less than 2%. In a further embodiment, the high MFR polymer extrudate exhibits a MWD of from about 1.5 to about 7, preferably from 1.5 to 4, more preferably from 1.5 to 3, even more preferably from 1.5 to 2.5.

[00134] Polymeric materials, such as those of the present invention, have been fabricated in non-woven and woven fabrics, fibers and microfibers. The polymeric material provides the physical properties required for product stability.

These materials should not change significantly in dimension, suffer reduced molecular weight, become less flexible or subject to stress cracking or physically deteriorate in the presence of sunlight, humidity, high temperatures or other negative environmental effects. In another embodiment, fibers are created from the high MFR polymer extrudate. These fibers may be made by any process known to those of skill in the art, including, but not limited to pneumatic drawing, mechanical drawing, melt spinning, melt blowing, spunbonding, centrifugal spinning, sheet slitting and film fibrillation. Further, a fabric may be formed from the extrudate fibers by processes known to those of skill in the art, such as melt blowing and spunbonding.

[00135] In another aspect, the non-woven fabric of the present invention, either alone or in conjunction with other materials, may be used to produce articles, including, but not limited to, filter media, medical/surgical gowns and drapes, diapers, feminine hygiene or adult incontinence products, absorbent mats, wipes, masks and wet tissues. Further the processes of the present invention include making useful articles such as those listed above from the non-woven fabrics of the present invention.

[00136] In accordance with the present invention, any values or ranges of MFR for a particular polymer, polymer composition (either before or after vis-breaking) or extrudate may, alternatively, be referenced with respect to MI under the conditions as defined herein.

[00137] While the present invention has been described and illustrated by reference to particular embodiments, those of ordinary skill in the art will appreciate that the invention lends itself to many different variations not illustrated herein. Further, certain features of the present invention are described in terms of a set of numerical upper limits and a set of numerical lower limits. It should be appreciated that ranges formed by any combination of these limits are within the scope of the invention unless otherwise indicated.

[00138] In yet other embodiments, the present invention includes:

- (a) A process for making propylene polymer pellets comprising:
mixing a neat propylene polymer, a hydroxylamine ester compound and a plasticizer to form a blend, where
- the neat propylene polymer exhibits a MFR of from 50 dg/min to 400 dg/min;
 - the hydroxylamine ester compound is present in the range of from 0.01% to 10% by weight based on the total weight of the neat propylene polymer;
 - the plasticizer is present in the range of from 0.01% to 25% by weight based on the total weight of the neat propylene polymer;
 - and
 - the blend exhibits a MFR of from not less than that of the neat propylene polymer to quadruple that of the neat propylene polymer;
- pelletizing the blend in a pelletizer to form blend pellets;
heating the blend pellets to form a high MFR polymer, where the high MFR polymer exhibits a MFR of about 400 to about 3500 dg/min; and
making a non-woven fabric from the high MFR polymer,
- wherein the mixing and pelletizing steps occur at a temperature below that which substantially thermally degrades the hydroxylamine ester compound.
- (b) The process of embodiment a, wherein the neat propylene polymer is selected from the group consisting of propylene polymers, propylene copolymers, polypropylene blends, propylene impact copolymers, polypropylene EPR blends, polypropylene EPDM blends, polypropylene elastomers and polypropylene vulcanizates.
- (c) The process of any of the preceding embodiments, wherein the plasticizer is selected from the group consisting of paraffins, hydrocarbon fluids, polyalpha olefin oligomers, polybutenes, mineral oils, phthalates,

substituted phthalates, substituted mellitates, substituted adipates and combinations thereof.

- (d) The process of any of the preceeding embodiments, wherein the plasticizer is selected from the group consisting of functionalized paraffins, non-functionalized paraffins, polyalpha olefin oligomers, polybutenes, mineral oils and combinations thereof.
- (e) The process of any of the preceeding embodiments, wherein the plasticizer is selected from the group consisting of polyalpha olefin oligomers, Group III basestocks, mineral oils and combinations thereof.
- (f) The process of any of the preceeding embodiments, wherein the plasticizer exhibits a viscosity index > 100 , a pour point $< -20^{\circ}\text{C}$, specific gravity < 0.86 and a flash point $> 200^{\circ}\text{C}$.
- (g) The process of any of the preceeding embodiments, further comprising: making an article from the non-woven fabric.
- (h) The process of embodiment g, wherein the article is selected from the group consisting of filter media, medical/surgical gowns, medical/surgical drapes, diapers, feminine hygiene products, adult incontinence products, absorbent mats, wipes, masks and wet tissues.
- (i) The process of any of the preceeding embodiments, wherein the high MFR polymer exhibits a MFR of about 1000 to about 2500 dg/min.
- (j) The process of any of the preceeding embodiments, wherein the high MFR polymer exhibits a MFR of about 1500 to about 2000 dg/min.
- (k) The process of any of the preceeding embodiments, wherein the high MFR polymer exhibits a MWD of 1.5 to 7.
- (l) The process of any of the preceeding embodiments, wherein the plasticizer is present in an amount of from 1.5 wt% to 15.0 wt% based on the total weight of the neat propylene polymer.
- (m) The process of any of the preceeding embodiments, wherein the plasticizer is present in the amount of from 2.0 wt% to 10.0 wt% based on the total weight of the neat propylene polymer.

- (n) The process of any of the preceeding embodiments, wherein the plasticizer is present in the amount of from 3.0 wt% to 8.0 wt% based on the total weight of the neat propylene polymer.
- (o) The process of any of the preceeding embodiments wherein the non-woven fabric is created using a process selected from pneumatic drawing, mechanical drawing, melt spinning, melt blowing, spunbonding and centrifugal spinning.
- (p) The process of any of the preceeding embodiments wherein the non-woven fabric is created using a process selected from melt blowing and spunbonding.
- (q) A non-woven fabric comprising a propylene polymer composition, the propylene polymer composition comprising a neat propylene polymer, a hydroxylamine ester compound and a plasticizer, where
the neat propylene polymer exhibits a MFR of from 50 to 400 dg/min;
the hydroxylamine ester compound is present in the range of about 0.01% to about 10% by weight based on the total weight of the neat propylene polymer;
the plasticizer is present in the range of from 0.01% to 25% by weight based on the total weight of the neat propylene polymer; and
the propylene polymer composition exhibits a MFR of from not less than that of the neat propylene polymer to quadruple that of the neat propylene polymer when maintained below an activation temperature, and from about quadruple that of the neat propylene polymer to about 3500 dg/min when heated above the activation temperature.
- (r) The non-woven fabric of embodiment q, wherein the neat propylene polymer is selected from the group consisting of propylene polymers, propylene copolymers, polypropylene blends, propylene impact copolymers, polypropylene EPR blends, polypropylene EPDM blends, polypropylene elastomers and polypropylene vulcanizates.
- (s) The non-woven fabric of any of embodiments q-r, wherein when heated to at least the activation temperature, the propylene polymer composition

exhibits a MFR of about 500 to about 1000 dg/min and comprises less than 1% oligomers.

- (t) The non-woven fabric of any of embodiments q-s, wherein when heated to at least the activation temperature, the propylene polymer composition exhibits a MFR of about 750 to about 2000 dg/min and comprises less than 3% oligomers.
- (u) The non-woven fabric of any of embodiments q-t, wherein when heated to at least the activation temperature, the propylene polymer composition exhibits a MFR of about 1000 to about 3000 dg/min and comprises less than 5% oligomers.
- (v) The non-woven fabric of any of embodiments q-u, wherein the activation temperature is about 300°C.
- (w) The non-woven fabric of any of embodiments q-v, wherein the activation temperature is about 280°C.
- (x) The non-woven fabric of any of embodiments q-w, wherein the activation temperature is about 260°C.
- (y) The non-woven fabric of any of embodiments q-x, wherein the activation temperature is about 240°C.
- (z) The non-woven fabric of any of embodiments q-y, wherein the plasticizer is present in an amount of from 1.5 wt% to 15.0 wt% based on the total weight of the neat propylene polymer.
- (aa) The non-woven fabric of any of embodiments q-z, wherein the plasticizer is present in the amount of from 2.0 wt% to 10.0 wt% based on the total weight of the neat propylene polymer.
- (bb) The non-woven fabric of any of embodiments q-aa, wherein the plasticizer is present in the amount of from 3.0 wt% to 8.0 wt% based on the total weight of the neat propylene polymer.
- (cc) An article comprising the non-woven fabric of any of embodiments q-bb.
- (dd) The article of embodiment cc, wherein the article is selected from the group consisting of filter media, medical/surgical gowns, medical/surgical drapes, diapers, feminine hygiene products, adult incontinence products, absorbent mats, wipes, masks and wet tissues.

EXAMPLES

[00139] Various propylene polymers (as described below) were melt blown to form non-woven fabrics under the conditions indicated.

[00140] For those examples using Polypropylene 6, the neat propylene polymer (a 150 MFR polypropylene homopolymer) was melt mixed with an amount of an Irgatec® CR76 masterbatch providing a hydroxylamine ester compound in the amount of 1.5 wt% based on the total weight of the neat propylene polymer. For those examples using Polypropylene 2, 3 or 4, the neat propylene polymer (a 65 MFR high crystallinity polypropylene homopolymer) was melt mixed with an amount of an Irgatec® CR76 masterbatch providing a hydroxylamine ester compound in the amount of 2.0 wt% based on the total weight of the neat propylene polymer. For all examples using Polypropylene 3 or 4, an addition of a plasticizer was made to the propylene polymer composition before re-pelletization. The resulting propylene polymer compositions were extruded and re-pelletized at approximately 190-200°C.

[00141] All of the propylene polymers and propylene polymer compositions of the examples were then melt blown on a Reifenhauer Bicomponent Melt Blowing Line (the "Reifenhauer Line") employing two 50 mm extruders and equipped with a 600 mm die having 805 holes, each 0.4 mm in diameter. The molten polymer streams from each extruder are combined before passing to the die. Residence time in the extruders is approximately ten to fifteen minutes. Hot air is distributed on each side of the die, uniformly extending the molten polymer before it is quenched to a solid fiber. The fibers are collected on a moving screened belt. The die to collector distance ("DCD") may be adjusted through vertical displacement of the equipment frame, and is indicated in Table 2 for each example.

[00142] The following propylene-containing materials were used in the Examples.

Table 1		
Reference Name	Tradename	Brief Description & Characteristics
Polypropylene 1	ExxonMobil 3746G	1500 MFR polypropylene homopolymer
Polypropylene 2		65 MFR Ziegler-Natta-catalyzed Polypropylene homopolymer with addition of 2 wt% Irgatec® CR76
Polypropylene 3		Polypropylene 2 with addition of 5 wt% ExxonMobil SpectraSyn® 10
Polypropylene 4		Polypropylene 2 with addition of 8 wt% ExxonMobil SpectraSyn® 10
Polypropylene 5	ExxonMobil Achieve® 6936G1	Metallocene-catalyzed polypropylene homopolymers
Polypropylene 6		150 MFR Ziegler-Natta-catalyzed Polypropylene homopolymer with addition of 1.5 wt% Irgatec® CR76

Table 2
HANDLE-O-METER TEST RESULTS

	Processing Flowrate	Die-to-Collector Distance 200 mm				Die-to-Collector Distance 250 mm			
		0.4 ghm	0.5 ghm	0.6 ghm	0.8 ghm	0.4 ghm	0.5 ghm	0.6 ghm	0.8 ghm
Polypropylene 1 (0.7 mm air gap, 0.8 mm setback)	Example #	1.1	1.2	1.3	1.4		1.5	1.6	1.7
	Handle (grams force)	30.0	29.6	28.2	33.8		24.0	25.1	24.3
Polypropylene 2	Example #	2.1	2.2	2.3					
	Handle (grams force)	32.8	27.0	23.3					
Polypropylene 3	Example #	3.1	3.2	3.3	3.4		3.5	3.6	3.7
	Handle (grams force)	23.0	21.2	21.8	25.7		19.4	19.4	21.3
Polypropylene 4	Example #	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8
	Handle (grams force)	19.2	17.7	20.5	18.8	20.6	18.0	19.0	18.5
Polypropylene 5	Example #	5.1	5.2	5.3	5.4	5.5	5.6		5.7
	Handle (grams force)	31.0	29.8	32.5	46.9	24.7	23.7		31.1
	Example #			5.8			5.9		
	Handle (grams force)			30.1			27.6		
Polypropylene 1 (1.2 air gap, 1.2mm set back)	Example #		1.8	1.9	1.10		1.11	1.12	1.13
	Handle (grams force)		35.2	29.6	27.5		26.1	27.5	35.9
Polypropylene 6	Example #		6.1	6.2	6.3				6.4
	Handle (grams force)		29.8	18.8	29.2				31.4

CLAIMS

What is claimed is:

1. A process for making propylene polymer pellets comprising:
mixing a neat propylene polymer, a hydroxylamine ester compound and a plasticizer to form a blend, where

the neat propylene polymer exhibits a MFR of from 50 dg/min to 400 dg/min;

the hydroxylamine ester compound is present in the range of from 0.01% to 10% by weight based on the total weight of the neat propylene polymer;

the plasticizer is present in the range of from 0.01% to 25% by weight based on the total weight of the neat propylene polymer;
and

the blend exhibits a MFR of from not less than that of the neat propylene polymer to quadruple that of the neat propylene polymer;

pelletizing the blend in a pelletizer to form blend pellets;

heating the blend pellets to form a high MFR polymer, where the high MFR polymer exhibits a MFR of about 400 to about 3500 dg/min; and

making a non-woven fabric from the high MFR polymer,

wherein the mixing and pelletizing steps occur at a temperature below that which substantially thermally degrades the hydroxylamine ester compound.
2. The process of claim 1, wherein the neat propylene polymer is selected from the group consisting of propylene polymers, propylene copolymers, polypropylene blends, propylene impact copolymers, polypropylene EPR

blends, polypropylene EPDM blends, polypropylene elastomers and polypropylene vulcanizates.

3. The process of claim 1, wherein the plasticizer is selected from the group consisting of paraffins, hydrocarbon fluids, polyalpha olefin oligomers, polybutenes, mineral oils, phthalates, substituted phthalates, substituted mellitates, substituted adipates and combinations thereof.
4. The process of claim 1, wherein the plasticizer is selected from the group consisting of functionalized paraffins, non-functionalized paraffins, polyalpha olefin oligomers, polybutenes, mineral oils and combinations thereof.
5. The process of claim 1, wherein the plasticizer is selected from the group consisting of polyalpha olefin oligomers, Group III basestocks, mineral oils and combinations thereof.
6. The process of claim 5, wherein the plasticizer exhibits a viscosity index > 100, a pour point < -20°C, specific gravity < 0.86 and a flash point > 200°C.
7. The process of claim 1, further comprising: making an article from the non-woven fabric.
8. The process of claim 7, wherein the article is selected from the group consisting of filter media, medical/surgical gowns, medical/surgical drapes, diapers, feminine hygiene products, adult incontinence products, absorbent mats, wipes, masks and wet tissues.
9. The process of claim 1, wherein the high MFR polymer exhibits a MFR of about 1000 to about 2500 dg/min.
10. The process of claim 1, wherein the high MFR polymer exhibits a MFR of about 1500 to about 2000 dg/min.

11. The process of claim 1, wherein the high MFR polymer exhibits a MWD of 1.5 to 7.
12. The process of claim 1, wherein the plasticizer is present in an amount of from 1.5 wt% to 15.0 wt% based on the total weight of the neat propylene polymer.
13. The process of claim 1, wherein the plasticizer is present in the amount of from 2.0 wt% to 10.0 wt% based on the total weight of the neat propylene polymer.
14. The process of claim 1, wherein the plasticizer is present in the amount of from 3.0 wt% to 8.0 wt% based on the total weight of the neat propylene polymer.
15. The process of claim 1 wherein the non-woven fabric is created using a process selected from pneumatic drawing, mechanical drawing, melt spinning, melt blowing, spunbonding and centrifugal spinning.
16. The process of claim 1 wherein the non-woven fabric is created using a process selected from melt blowing and spunbonding.
17. A non-woven fabric comprising a propylene polymer composition, the propylene polymer composition comprising a neat propylene polymer, a hydroxylamine ester compound and a plasticizer, where
the neat propylene polymer exhibits a MFR of from 50 to 400 dg/min;
the hydroxylamine ester compound is present in the range of about 0.01% to about 10% by weight based on the total weight of the neat propylene polymer;
the plasticizer is present in the range of from 0.01% to 25% by weight based on the total weight of the neat propylene polymer; and
the propylene polymer composition exhibits a MFR of from not less than that of the neat propylene polymer to quadruple that of the neat propylene

polymer when maintained below an activation temperature, and from about quadruple that of the neat propylene polymer to about 3500 dg/min when heated above the activation temperature.

18. The non-woven fabric of claim 17, wherein the neat propylene polymer is selected from the group consisting of propylene polymers, propylene copolymers, polypropylene blends, propylene impact copolymers, polypropylene EPR blends, polypropylene EPDM blends, polypropylene elastomers and polypropylene vulcanizates.
19. The non-woven fabric of claim 17, wherein when heated to at least the activation temperature, the propylene polymer composition exhibits a MFR of about 500 to about 1000 dg/min and comprises less than 1% oligomers.
20. The non-woven fabric of claim 17, wherein when heated to at least the activation temperature, the propylene polymer composition exhibits a MFR of about 750 to about 2000 dg/min and comprises less than 3% oligomers.
21. The non-woven fabric of claim 17, wherein when heated to at least the activation temperature, the propylene polymer composition exhibits a MFR of about 1000 to about 3000 dg/min and comprises less than 5% oligomers.
22. The non-woven fabric of claim 17, wherein the activation temperature is about 300°C.
23. The non-woven fabric of claim 17, wherein the activation temperature is about 280°C.
24. The non-woven fabric of claim 17, wherein the activation temperature is about 260°C.

25. The non-woven fabric of claim 17, wherein the activation temperature is about 240°C.
26. The non-woven fabric of claim 17, wherein the plasticizer is present in an amount of from 1.5 wt% to 15.0 wt% based on the total weight of the neat propylene polymer.
27. The non-woven fabric of claim 17, wherein the plasticizer is present in the amount of from 2.0 wt% to 10.0 wt% based on the total weight of the neat propylene polymer.
28. The non-woven fabric of claim 17, wherein the plasticizer is present in the amount of from 3.0 wt% to 8.0 wt% based on the total weight of the neat propylene polymer.
29. An article comprising the non-woven fabric of claim 17.
30. The article of claim 29, wherein the article is selected from the group consisting of filter media, medical/surgical gowns, medical/surgical drapes, diapers, feminine hygiene products, adult incontinence products, absorbent mats, wipes, masks and wet tissues.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2007/010097

A. CLASSIFICATION OF SUBJECT MATTER
INV. C08F8/50 C08J3/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C08F C08J C08K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GANDE M ET AL: "New Effects to Improve Function and Performance of Nonwoven Fabrics" INTERNET CITATION, [Online] 16 March 2005 (2005-03-16), XP002447653 Retrieved from the Internet: URL:http://www.cibasc.com/pf/docMDMS.asp?targetlibrary=CHBS_PA_MADS&docnumber=7050> [retrieved on 2007] pages 4-10 pages 16-19	1-30
Y	US 2006/008643 A1 (LIN CHON Y [US] ET AL) 12 January 2006 (2006-01-12) paragraphs [0003] - [0005], [0823], [0051] - [0065], [0105] - [0110], [0215] - [0217], [0239], [0240], [0268], [0280], [0285]; table 9 ----- -/--	1-30

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 7 030 196 B2 (ROTH MICHAEL [DE] ET AL) 18 April 2006 (2006-04-18) column 33, lines 4-9 examples C36,C37 -----	1-30

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/010097

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2006008643	A1	12-01-2006	NONE	
US 7030196	B2	18-04-2006	US 2003216494 A1	20-11-2003