Biolubricants: technical and market survey

September 2010 – December 2011

01-- PATENT: SYNTHESIS OF DIESTER-BASED LUBRICANTS FROM ENZYMATICALLY-DIRECTED EPOXIDES

Patent number: MX2011005031 (A)
Publication date: 2011-06-16
Inventor: BORCH KIM [DK]; MILLER STEPHEN JOSEPH; ELOMARI SALEH A; ZHOU ZHEN; BRASK JESPER
Applicant: NOVOZYMES AS [DK]
Category: C10M129/72; C10M177/00; C12P17/02; C12P7/62

The present invention is generally directed to methods of making diester-based lubricant compositions, wherein formation of diester species proceeds via esterification of epoxide intermediates, and wherein the epoxide intermediates are generated via an enzymatically-driven mechanism. In some embodiments, the methods for making such diester-based lubricants utilize a biomass precursor and/or low value (e.g., Fischer-Tropsch (FT) olefins and/or alcohols) so as to produce high value diester-based lubricants. In some embodiments, such diester-based lubricants are derived from FT olefins and fatty acids. The fatty acids can be from a bio-based source (i.e., biomass, renewable source) or can be derived from FT alcohols via oxidation.

02-- PATENT: ESTOLIDE COMPOSITIONS HAVING EXCELLENT LOW TEMPERATURE PROPERTIES

Patent number: WO2011037778 (A1)
Publication date: 2011-03-31
Inventor: GREAVES MARTIN R [CH]; KHELIDJ NADJET [CH]
Applicant: DOW GLOBAL TECHNOLOGIES INC [US]; GREAVES MARTIN R [CH]; KHELIDJ NADJET [CH]
Category: C09K8/34; C10M169/04F

A lubricant or process fluid composition having excellent low temperature properties comprises a capped estolide ester, a polyalphaolefin, a synthetic ester and/or polyalkylene glycol, and a pour point depressant. The combination of the three base oils plus the pour point depressant produces a synergistic composition that may have a pour point less than -15 DEG C, preferably less than -35 DEG C, while also having more than 50 percent by weight renewable carbons and being economical and effective in a wide variety of applications.

03-- PATENT: LIQUID-LIQUID EXTRACTION PROCESS FOR THE PURIFICATION OF ESTOLIDES FOR USE AS LUBRICANTS

Patent number: US2011092723 (A1)
Publication date: 2011-04-21
Inventor: ROSAS DANIELLE DE OLIVEIRA [BR]; FERRERA BAUER COSTA [BR]; LEITE DENISE DINIZ [BR]
Applicant: PETROLEO BRASILEIRO SA [BR]
Category: C10M101/04; C10M105/42; C11C1/08; C11C1/10
A process is described for the purification of estolides for subsequent use as lubricants. This purification process comprises the removal of free fatty acids present in the estolide by liquid-liquid extraction using an alcohol, preferably ethanol or methanol, as solvent, where the total acid number of the estolide after purification is less than 1 mg KOH/g of sample, which endows it with characteristics of oxidation stability suitable for its use as a lubricant.

04-- PATENT: ESTOLIDE DERIVATIVES USEFUL AS BIOLUBRICANTS

Patent number: US2011213170 (A1)
Publication date: 2011-09-01
Inventor: VINCI DANIELE [BE]; BECKERDITE JOHN [US]
Applicant:
Category: C08G63/06; C08G63/91B; C10M105/42
A double ester composition prepared by a three-step process comprising the non-ordered steps of a homopolymerization, a transesterification, and a capping, wherein the ordered steps include a sequence of homopolymerization, capping, and transesterification, or a sequence of transesterification, homopolymerization, and capping. The ester is useful particularly as a biolubricant having a high level of renewable carbons, and may exhibit particularly desirable properties relating to pour point, thermo-oxidative stability, and viscometric behavior due to reduced or eliminated levels of unsaturation in the final double esters.

05-- PATENT: LUBRICATING GREASES CONTAINING LIGNOSULFONATE, THE PRODUCTION THEREOF, AND THE USE THEREOF

Patent number: WO2011095155 (A1)
Publication date: 2011-08-11
Inventor: LITTERS THOMAS [DE]; LIEBENAU ALEXANDER [DE]
Applicant: FUCHS PETROLUB AG [DE]; LITTERS THOMAS [DE]; LIEBENAU ALEXANDER [DE]
Category: C10M135/10; C10M141/08; C10M159/24
The invention relates to lubricating greases that contain calcium lignosulfonate, comprising a base oil, calcium soaps, calcium lignosulfonate having average molecular weights (weight average) of greater than 10000 g/mol, optionally in addition to further

alkaline earth lingosulfonates, which can be produced by heating to greater than 120 DEG C while reacting and while driving out low-boiling components to produce a basic grease and cooling and adding base oil and optionally additives while mixing, to a corresponding method, and to the use of the lubricating greases containing calcium lignosulfonate.

06-- PATENT: VEGETABLE OIL OF HIGH DIELECTRIC PURITY, METHOD FOR OBTAINING SAME AND USE IN AN ELECTRICAL DEVICE

Patent number: US2011204302 (A1)
Publication date: 2011-08-25
Inventor: PULIDO SANCHEZ ALBERTO JOSE [MX]; URZUA HERNANDEZ CARLOS MANUEL [MX]; CAZARES MENDEZ SERGIO FRANCISCO [MX]; VILLARREAL RIOS JERONIMO R [MX]; CONTRERAS DE LEON JOSE EULALIO [MX]; GUERRA ZUBIAGA DAVID APOLINAR [MX]
Applicant:
Category: C10M101/04
A dielectric high purity vegetable oil-free from antioxidants and/or external additives to be used in electric equipment such as transformers, as isolating element and as cooling means and a method for obtaining the same in which the dielectric high purity vegetable oil-is obtained by means of the optimization of the bleaching steps-and deodorizing-from the Refining process-known as Modified Caustic Refining Long-Mix (RBD).

07-- PATENT: METHOD OF MAKING A VEGETABLE OIL DIELECTRIC FLUID COMPOSITION

Patent number: EP2388785 (A1)
Publication date: 2011-11-23
Inventor: RAPP KEVIN JAMES [US]; GAUGER GARY ARDEN [US]; MCSHANE CHARLES PATRICK [US]; LEMM ARTHUR WARREN [US]
Applicant: COOPER IND INC [US]
Category: C10M169/04; H01B3/20; H01B3/22
A method of making a dielectric fluid, comprising: providing at least one refined, bleached and deodorized rapeseed oil with a pour point of less than -20 DEG C as measured by at least one of ASTM D97 and ASTM D5950, wherein the rapeseed oil is derived from non-GMO winter rapeseeds grown in a northern European climate; treating the rapeseed oil with clay; and filtering the rapeseed oil to produce a processed rapeseed oil.

08-- PATENT: LUBRICANT COMPOSITION BASED ON NATURAL AND RENEWABLE RAW MATERIALS

Patent number: MX2010013119 (A)
Publication date: 2011-04-11
Inventor: SCHMIDT-AMELUNXEN MARTIN [DE]; KILTHAU THOMAS; ZIRKEL SARAH
Applicant: KLUEBER LUBRICATION [DE]
Category: C10M169/04; C10M177/00
The invention relates to a lubricant composition based on modified, natural and renewable raw materials, the viscosity of which can be adjusted according to the application. The invention relates more particularly to biodegradable lubricant compositions.

09-- PATENT: ENVIRONMENTALLY-FRIENDLY KELP-BASED ENERGY SAVING LUBRICANTS, BIOFUELS, AND OTHER INDUSTRIAL PRODUCTS

Patent number: US2011152144 (A1)
Publication date: 2011-06-23
Inventor: COPP EMMANUEL ANTHONY [US]; GLANTZ DALE [US]
Applicant: OCEANFUELS INC [US]
Category: C10L5/36B; C10L5/44; C10M111/04; C10M159/02; C10M177/00; Y02E50/10; Y02E50/30

A natural algae-based synthetic lubricant derived from harvesting kelp from the ocean, recovering sieve sap from the kelp, drying the sieve sap, and removing salts and oxides to leave a composition having a concentration of polyols (Mannitol about 70% and Mannose about 0.4%) and about 28% by weight of a high molecular weight polymer. The synthetic lubricant may be used as a drag reducing agent and additive for existing lubricants and also further reacted with fatty esters to form a hybrid lubricant that may serve as a total replacement for existing lubricants.

10-- PATENT: CONVERSION OF VEGETABLE OILS TO BASE OILS AND TRANSPORTATION FUELS

Patent number: MX2011000674 (A)
Publication date: 2011-03-01
Inventor: MILLER STEPHEN J [US]
Applicant: CHEVRON USA INC [US]
Category: C10G3/00; C10G50/00; C10G57/02; C10G65/04D; C10G69/12P; C10L1/08; C10M105/04; C10M107/10

The present invention is directed to methods (processes) and systems for processing triglyceride-containing, biologically-derived oils to provide for base oils and transportation fuels, wherein partial oligomerization of fatty acids contained therein provide for an oligomerized mixture from which the base oils and transportation fuels can be extracted. Such methods and systems can involve an initial hydrotreating step or a direct isomerization of the oligomerized mixture.

11-- PATENT: COMPOSITION OF BIODEGRADABLE GEAR OIL

Patent number: US2011207638 (A1)
Publication date: 2011-08-25
Inventor: SINGH ARUN KUMAR [IN]; CHAMOLI ARUNA [IN]
Applicant:
Category: C10M105/34; C10M109/02; C10M169/04F; C10M169/04L

A composition of biodegradable gear oil that mainly contains modified nontauedible vegetable oils. Mono-esters are hydrogenated, epoxidized or aryl alkylated or mixture thereof, and C7 to C12 primary alcohol. In addition to chemically modified non-edible vegetable oils, the composition also contains an additive pack, which comprises at least one: antioxidant, an extreme pressure additive, an anti foaming agent, a pour point depressant, a corrosion inhibitor and a detergent-dispersant additive. The product of this invention has utility as industrial and automotive gear oil GL 4 grade. The compositions are significantly biodegradable, eco-friendly, reduce use of petroleum, have lower cost than synthetic oil, are miscible in mineral & synthetic fluids and safe to use due to higher flash point.

12-- PATENT: CHEMICALLY MODIFIED VEGETABLE OIL-BASED INDUSTRIAL FLUID

Patent number: USRE42313 (E1)
Publication date: 2011-04-26
Inventor: ERHAN SEVIM Z [US]; ADHVARYU ATANU [US]; LIU ZENGSHE [US]
Applicant: US OF AMERICA AS REPESENTED BY THE SECRETARY OF AGRICULTURE [US]; PENN STATE RES FOUND [US]
Category: C07C69/708; C10M105/40; C10M105/42; C07C67/08

Triglyceride oils having unsaturated fatty acid substituents are modified to convert sites of unsaturation to C-2 to C-10 diesters. The resulting derivatives are characterized by thermal and oxidative stability, have low temperature performance properties and are environmentally-friendly. They have utility as hydraulic fluids, lubricants, metal working fluids and other industrial fluids. The triglyceride oils are most easily prepared via epoxidized vegetable oils which are converted to the diesters in either a one- or two-step reaction.

13-- PATENT: METHOD FOR OPERATING A FILTER PRESS USING A NON-MINERAL HYDRAULIC OIL

Patent number: WO2011060461 (A1)
Publication date: 2011-05-26
Inventor: DENKINGER FRANZ [DE]
Applicant: ANDRITZ AG MASCHF [AT]; DENKINGER FRANZ [DE]
Category: B01D25/00C; C10M105/34

The invention relates to a method for a filter press using a non-mineral oil. The invention is characterized in that palm oil or palm kernel oil is used as the non-mineral oil as a hydraulic oil in the oil circuit, wherein the palm oil or palm kernel oil is conducted in the circuit and at a pressure greater than approximately 150 bar and the temperature is held at a distance from the melting temperature. Said method leads to high stability of the oil and expands the usage possibilities of the filter press. The invention further relates to a system for performing the method.

14-- PATENT: LUBRICANT COMPOSITION AND METHODS OF MANUFACTURE THEREOF

Patent number: MX2010012119 (A)
Publication date: 2011-02-21
Inventor: BLOOM PAUL [US]
Applicant: ARCHER DANIELS MIDLAND CO [US]
Category: C10G3/00; C10M129/70; C10M145/22

Processes are described for producing liquid, biobased lubricant additives containing from 50 to 100% biobased carbon according to ASTM D6866 from heat-bodied oils by transesterification with biobased or petroleum based alcohols and by hydrogenation of at least the resulting diesters, triesters and polyesters

15-- PATENT: GREASE COMPOSITION, GREASE-PACKED BEARING, UNIVERSAL JOINT FOR PROPELLER SHAFT, LUBRICATING OIL COMPOSITION, AND OIL-IMPREGNATED SINTERED BEARING

Patent number: WO2010098337 (A1)
Publication date: 2010-09-02
Inventor: MIKAMI HIDENOBU; TAGUCHI YOSUKE; KAWAMURA TAKAYUKI

Applicant: NTN TOYO BEARING CO LTD [JP]; MIKAMI HIDENOBU; TAGUCHI YOSUKE; KAWAMURA TAKAYUKI
Category: C10M129/14; F16C33/10; F16C33/66
A grease composition or lubricating oil composition which can effectively prevent the rolling surfaces of a rolling bearing or the like from suffering hydrogen embrittlement and resultant flaking, has excellent high-temperature high-speed durability, and can be used for long. Provided is a grease-packed bearing (1) which is equipped with an inner ring (2), an outer ring (3), and a plurality of rolling elements (4) and in which sealing members (6) for enclosing a grease composition (7) around the rolling elements have been disposed in both shaft-direction edge openings (8a, 8b) between the inner ring (2) and the outer ring (3). The grease composition (7) comprises a base grease comprising a base oil and a thixotropic agent and an additive incorporated in the base grease, the additive comprising at least one compound selected from plant-derived polyphenol compounds and products of decomposition thereof, the compounds being tannin, gallic acid, ellagic acid, chlorogenic acid, caffeic acid, curcumin, quercetin, quinic acid, etc.

16-- PATENT: DOUBLE ESTERS AND LUBRICANTS THEREOF

Patent number: WO2010123492 (A1)
Publication date: 2010-10-28
Inventor: THOEN JOHAN [BE]; KERSBULCK JOCHEM [NL]; SINNEMA JACOBUS [BE]
Applicant: DOW GLOBAL TECHNOLOGIES INC [US]; THOEN JOHAN [BE]; KERSBULCK JOCHEM [NL]; SINNEMA JACOBUS [BE]
Category: C10M105/38; C10M105/44; C10M129/74; C10M129/78
A new compound that comprises a branched ester based primarily on renewable resources preferably has good friction properties, a low pour point; acceptable viscosity, and good thermal oxidative stability and is useful as a functional fluid such as a lubricant. The branched ester is a double ester of a polyhydric alcohol having at least two active hydrogen groups separated by at least one carbon atom, wherein each hydroxyl group of the polyhydric alcohol is esterified with one monobasic secondary hydroxy fatty acid group and each hydroxyl of a fatty acid is esterified with one alkyl or cycloalkyl monobasic carboxylic acid group that has from 2 to 22 carbon atoms.

17-- PATENT: CONCENTRATE FOR PRODUCING A COOLING AND RELEASE AGENT OR A COOLING AND LUBRICATING AGENT AND SUCH COOLING AND RELEASE AGENTS AND COOLING AND LUBRICATING AGENTS

Patent number: WO2011006777 (A1)
Publication date: 2011-01-20
Inventor: LAUDENKLOS MANFRED [DE]; REIHMANN MATTHIAS [DE]
Applicant: KS ALUMINIUM TECHNOLOGIE GMBH [DE]; GELITA AG [DE]; LAUDENKLOS MANFRED [DE]; REIHMANN MATTHIAS [DE]
Category: C10M173/02
Known cooling and release agents or lubricating agents are not biodegradable and tend to form undesired layer buildup when applied repeatedly to the casting die. The invention therefore proposes using a concentrate for producing a cooling and release agent for reusable casting dies, particularly steel casting dies, or a cooling and lubricating agent, particularly for machining, having an active substance dissolved in water and comprising a protein having a weight proportion of 10% to 50%. Good releasability of the cast parts from the casting die and a good cooling effect on the casting die are obtained using such a cooling and release agent or lubricating agent. Said agent is further biodegradable.

18-- PATENT: LUBRICANT ADDITIVES

Patent number: MX2010012119 (A)
Publication date: 2011-02-21
Inventor: BLOOM PAUL [US]
Applicant: ARCHER DANIELS MIDLAND CO [US]
Category: C10G3/00; C10M129/70; C10M145/22

Processes are described for producing liquid, biobased lubricant additives containing from 50 to 100% biobased carbon according to ASTM D6866 from heat-bodied oils by transesterification with biobased or petroleum based alcohols and by hydrogenation of at least the resulting diesters, triesters and polyesters

19-- PATENT: A PROCESS FOR PRODUCTION OF BIOLUBRICANT USING FLY ASH AS A CATALYST

Patent number: WO2011007361 (A1)
Publication date: 2011-01-20
Inventor: NAGABHUSHANA KYATANAHALLI SRINIVASA [IN]; MAL NAWALKISHOR [IN]; SHINDE TUSHAR [IN]; DAPURKAR SUDHIR [IN]; KUMAR RAJIV [IN]
Applicant: TATA CHEMICALS LTD [IN]; NAGABHUSHANA KYATANAHALLI SRINIVASA [IN]; MAL NAWALKISHOR [IN]; SHINDE TUSHAR [IN]; DAPURKAR SUDHIR [IN]; KUMAR RAJIV [IN]
Category: C07C67/03; C07C67/03; C07C67/08; C07C67/08

A process for production of alkyl esters is disclosed. The process comprises reacting a feedstock that includes one or more fatty acid glycerol esters or one or more fatty acids or mixture thereof with a C5 to C12 alcohol in the presence of fly ash as a catalyst. A catalyst composite material for the production of alkyl esters having a C5 to C12 alkyl chain from a feedstock including one or more fatty acid glycerol esters or one or more fatty acids or mixture thereof, wherein the catalyst includes fly ash is also disclosed.

20-- PATENT: LUBRICANT FOR POWDER METALLURGY

Patent number: WO2010105740 (A1)
Publication date: 2010-09-23
Inventor: LINDENAU RENE [DE]; WIMBERT LARS [DE]
Applicant: GKN SINTER METALS HOLDING GMBH [DE]; LINDENAU RENE [DE]; WIMBERT LARS [DE]
Category: B22F1/00A4N; C04B35/632; C10M105/38; C10M105/40; C10M169/04

In order to solve the problem of providing a lubricant for powder metallurgy which is relatively unobjectionable with respect to occupational safety and environmental aspects, a mixture is proposed comprising carnauba wax and at least one vegetable or animal fat.

21-- PATENT: VEGETABLE OIL-BASED HYDRAULIC FLUID AND TRANSMISSION FLUID

Patent number: US2011195885 (A1)
Publication date: 2011-08-11
Inventor: BOTZ OTTO [CH]
Applicant: VENYARD GMBH
Category: C10M101/04

The invention relates to using vegetable oil having a natural viscosity index (VI) of greater or equal to 200 as a pressure medium in hydraulic systems and as a transmission fluid. The vegetable oil has a portion of monounsaturated fatty acids of at least 80%, a

portion of double unsaturated fatty acids of 1-10% at maximum, and a portion of triple unsaturated fatty acids of less than 1%, preferably less than 0.1%. Part of the vegetable oil can be used in the form of an unsaturated ester of the vegetable oil. The vegetable oil can also contain an additive in a portion of 2-5% by weight selected from anti-oxidants, copper deactivators, anti-corrosion agents, wear protection agents and anti-foaming agents. The shear stability of the vegetable oil used according to the invention equals 0.7% or less, measured over 20 hours of use.

22-- PATENT: SYNTHESIS OF BIOLUBRICANT ESTERS FROM UNSATURATED FATTY ACID DERIVATIVES

Patent number: WO2011005604 (A2)
Publication date: 2011-01-13
Inventor: ELOMARI SALEH A [US]; MILLER STEPHEN JOSEPH [US]; ZHOU ZHEN [US]
Applicant: CHEVRON USA INC [US]; ELOMARI SALEH A [US]; MILLER STEPHEN JOSEPH [US]; ZHOU ZHEN [US
Category: C10M105/38; C11C3/00; C11C3/12; C07C29/132; C07C29/147; C07C67/08
The present invention is generally directed to diester-based lubricant compositions comprising one or more isomeric mixtures of diester species. The present invention is also directed to methods of making these and other similar lubricant compositions. In some embodiments, the methods for making such diester-based lubricants utilize a biomass precursor material from which mono-unsaturated free lipid species can be provided or otherwise generated, wherein such mono-unsaturated free lipid species are converted to isomeric diol species en route to the synthesis of diester species for use as/in the diester-based lubricant compositions.

23-- PATENT: BIOLUBRICANT ESTERS FROM THE ALCOHOLS OF UNSATURATED FATTY ACIDS

Patent number: WO2010144296 (A2)
Publication date: 2010-12-16
Inventor: ELOMARI SALEH [US]; MILLER STEPHEN JOSEPH [US]; ZHOU ZHEN [US]
Applicant: CHEVRON USA INC [US]; ELOMARI SALEH [US]; MILLER STEPHEN JOSEPH [US]; ZHOU ZHEN [US]
Category: C07C69/30; C10M129/74; C07C29/10D4; C07C29/147; C07C67/08
The present invention is generally directed to triester-based lubricant compositions. The present invention is also directed to methods of making these and other similar lubricant compositions. In some embodiments, the methods for making such triester-based lubricants utilize a biomass precursor comprising mono-unsaturated fatty acids, wherein such mono-unsaturated fatty acids are reduced to mono-unsaturated fatty alcohols en route to the synthesis of triester species for use as/in the triester-based lubricant compositions. Subsequent steps in such synthesis may employ carboxylic acids and/or acyl halides/anhydrides derived from biomass and/or Fischer-Tropsch synthesis.

24-- PATENT: MODIFIED VEGETABLE OIL LUBRICANTS

Patent number: WO2010104609 (A2)
Publication date: 2010-09-16
Inventor: BENECKE HERMAN PAUL [US]; GARBARK DANIEL B [US]; VIJAYENDRAN BHIMA RAO [MY]; CAFMEYER JEFFREY [US]
Applicant: BATTELLE MEMORIAL INSTITUTE [US]; BENECKE HERMAN PAUL [US]; GARBARK DANIEL B [US]; VIJAYENDRAN BHIMA RAO [MY]; CAFMEYER JEFFREY [US]

Category: C10M105/42; C10M109/02; C11C3/00; C11C3/04
Lubricants based on renewable feedstocks and methods of making them.

25-- PATENT: ENVIRONMENTALLY-FRIENDLY LUBRICANT COMPOSITIONS

Patent number: BRPI0707809 (A2)
Publication date: 2011-05-10
Inventor: FUJITSU TAKASHI; GRIFFITHS JOANNA
Applicant: SHELL INT RESEARCH [NL]
Category: C10M161/00
A lubricating oil composition comprising base oil, one or more glycerol esters selected from glycerol monooleate and/or glycerol dioleate, optionally in combination with glycerol trioleate, wherein said composition further comprises one or more dispersant- viscosity index improver compounds and an additive amount of one or more additional polyhydric alcohol esters; and a method of lubricating an internal combustion engine comprising applying said lubricating oil composition thereto.

26-- PATENT: POLYOL ESTERS OF MEDIUM CHAIN FATTY ACIDS AND PROCESS FOR PREPARATION THEREOF

Patent number: US2011263885 (A1)
Publication date: 2011-10-27
Inventor: KORLIPARA VENKATA PADMAJA [IN]; BHAMIDIPATI VENKATA SURYA KOPPESWARA RAO [IN]; POTULA SATYA BHASKAR [IN]; RACHAPUDI BADARI NARAYANA PRASAD [IN]; SINGH ARUN KUMAR [IN]
Applicant:
Category: C07C69/28; C07C69/30; C07C69/33; C07C69/533; C10M105/38
The present invention relates to a lubricant composition. The present invention more particularly relates to a fully miscible lubricant composition that comprises a polyether and a renewable raw material such as an unsaturated seed or vegetable oil.
A new class of oleochemical based polyol esters of general formula 1 are prepared by esterification of different polyols having 5-6 carbon atoms and 2-4 hydroxyl groups with 10-undecenoic acid or/and undecanoic acid with a hydroxyl value of !<=1.0 mg KOH/g. Wherein R1, R2, R3 is selected from a group consisting of CH3-, CH3CH2-, -CH2OCOR4 wherein R4 is selected from CH2-CH-(CH2)8- or CH3-(CH2)9-, individually or in combination thereof. The resulting esters were characterized for lubricant properties like viscosity, viscosity index, pour point, flash point and copper corrosion tests. The properties indicate their potential as promising lubricant base stocks for automotive lubricants, metal working oil, hydraulic oil and other industrial applications. Vegetable oils provide most of the desirable lubricant properties such as good boundary lubrication, high viscosity index, high flash point and low volatility. Synthetic esters prepared from renewable resources like vegetable oils exhibit better performance at a lower cost compared to mineral oil based synthetic esters.

27-- PATENT: MODIFICATION OF FATS AND OILS FOR FUEL AND LUBRICATING APPLICATIONS

Patent number: US2011139106 (A1)
Publication date: 2011-06-16
Inventor: RISSIO JOHN [US]; CAMERON JOHN [US]
Applicant: 21ST CENTURY R & D LLC [US]
Category: C10L1/02B; C10L1/02D; C10L10/14; C10M159/00; Y02E50/13

A bio-organic composition includes residues of a fatty acid glyceride-containing composition, residues of a first epoxide or glycol, and the residues of a second epoxide. The fatty acid glyceride-containing composition is characterized by the viscosity at room temperature. The first epoxide or glycol and second epoxides are present in a sufficient amount that the room temperature viscosity of the bio-organic composition is lower than the room temperature viscosity of the vegetable oil prior to formulation and/or the first epoxide or glycol and second epoxides are present in a sufficient amount that the pour point of the bio-organic composition is lower than the pour point of the fatty acid glyceride-containing composition prior to formulation.

28-- PATENT: LUBRICANT COMPOSITION AND METHODS OF MANUFACTURE THEREOF

Patent number: DE112009002292 (T5)
Publication date: 2011-09-29
Inventor: PETTERSEN ERIC MADDOCKS [US]
Applicant: GREENGOLD LUBRICANTS LLC [US]
Category: C09K5/10; C10M125/22; C10M169/04; C10M173/00

Disclosed herein is a lubricant composition comprising soybean oil; and molybdenum disulfide; the molybdenum disulfide being dispersed in the soybean oil. Disclosed herein too is a method comprising agitating molybdenum disulfide with soybean oil in a reactor; the mixing being conducted in the presence of a magnetic field that is greater than the earth's field and an electrical field. Disclosed herein too is a coolant composition comprising water; soap and/or a surfactant; and a lubricant composition; the lubricant composition comprising soybean oil and molybdenum disulfide. Disclosed herein too is a method of manufacturing a coolant composition comprising mixing a lubricant composition, water and soap; the lubricant composition comprising a base oil and a metal sulfide.

29-- PATENT: DIESTER-BASED LUBRICANTS AND METHODS OF MAKING SAME

Patent number: US2010261627 (A1)
Publication date: 2010-10-14
Inventor: MILLER STEPHEN JOSEPH [US]; ELOMARI SALEH A [US]
Applicant: CHEVRON USA INC [US]
Category: C07C29/10D4; C07C69/28; C10M105/38; C07C67/14

The present invention is generally directed to diester-based lubricant compositions. The present invention is also directed to methods of making these and other similar lubricant compositions. In some embodiments, the methods for making such diester-based lubricants utilize a biomass precursor and/or low value Fischer-Tropsch (FT) olefins and/or alcohols so as to produce high value diester-based lubricants. In some embodiments, such diester-based lubricants are derived from FT olefins and fatty acids. The fatty acids can be from a bio-based source (i.e., biomass, renewable source) or can be derived from FT alcohols via oxidation.

30-- PATENT: BIODEGRADABLE LUBRICATION SOLUTION FOR METALS

Patent number: EP2366765 (A1)
Publication date: 2011-09-21
Inventor: JEANNERAT PHILIPPE [CH]
Applicant: FRANCOIS GATHERAT S A [CH]
Category: C10M173/02

Aqueous lubricating solution comprises: ethanol; surfactant; sodium triphosphate; ion exchanger; polycarboxylate; an organic compound capable of producing photosynthesis reaction when irradiated by a light source; and chlorophyll. Independent claims are included for: (1) a process of applying a lubricating film on the surface of a metal part using the lubricating solution comprising: irradiating the lubricating solution with a light source; injecting carbon dioxide into the lubricating solution; and applying the lubricating solution on the component to cover the part of the lubricating film; and (2) a device for carrying out the process for applying lubricant film comprising: a tank to contain the lubricating solution; a lamp comprising the light source and a pipe for feeding and injecting carbon dioxide into the lubricating solution.

31-- PATENT: PROCEDURES FOR PRODUCTION OF EMULSIONS OF HYDROCARBONS, WATER AND ORGANOPHILIC CLAY AND THEIR COMPOSITIONS

Patent number: RU2008145221 (A)
Publication date: 2010-05-27
Inventor: POMERLO DAN'EL' GI
Applicant: EHNDZHINIRED DRILLING SOL'JUSHNS INK
Category: C09K8/36; C10M173/00

FIELD: oil and gas production. SUBSTANCE: procedure for control of viscosity of oil/water emulsion consists in stage of addition of efficient amount of emulsifying agent EA into emulsion containing organophilic clay OC, and EA is chosen from: any one saturated C8-C18 fat acid -SFA, mixture of two or more C8-C18 SFA, mixture of C8-C18 SFA and at least one 2-5 n of not saturated fat acid NSFA, and vegetable oil of group: safflower oil, olive oil, cottonseed oil, coconut oil, peanut oil, palm kernel oil, canola oil and tall oil. In the procedure of said control EA corresponds to mixture of SFA and NSFA with their selected ratio. The procedure for stability of emulsion consists in a stage of addition of efficient amount of said EA into emulsion containing OC.; The procedure for increased stability of emulsion consists in a stage of addition of efficient amount of said SFA into emulsion containing OC. The procedure for increased hydrophobic properties of emulsion consists in a stage of addition of efficient amount of said SFA into emulsion containing OC. The procedure for production of emulsion consists in mixing phases with OC and in addition of said EA. The composition contains a continuous phase - hydrocarbon, and a dispersed phase - water, OC and said EA. Composition of drilling agent contains the above said phases, OC and said EA. Procedure for borehole drilling consists in drilling and in circulation of drilling agent on oil base containing above said composition. EFFECT: increased stability of viscosity and stability of emulsions oil-water.

32-- PATENT: OXIDIZED AND MALEATED DERIVATIVE COMPOSITION

Patent number: MX2010008310 (A)
Publication date: 2010-12-21
Inventor: HINES JOHN B [US]; HURD PHILLIP W; NEUMANN BRETT A; JOHNSON ROGER SCOTT
Applicant: GEORGIA PACIFIC CHEMICALS LLC [US]
Category: B03D1/008; B03D1/01; B03D1/012; B03D1/014; B03D1/018; B03D1/02B; C04B24/12H; C04B24/34; C09D5/08B4; C09F7/02; C10M129/60; C10M159/12; C23F11/10; C23F11/12; C23F11/12D

Oxidized and maleated derivative compositions, such as chemically modified oxidized and maleated tall oil fatty acid compositions, can be prepared and used in a variety of

industrial applications, including as emulsifiers, corrosion inhibitors, concrete admixtures, and in reverse flotation mining applications

33-- PATENT: METAL-WORKING OIL, METAL-WORKING METHOD, AND METAL-WORKED PRODUCT

Patent number: JP2011063765 (A)
Publication date: 2011-03-31
Inventor: GOTO KOICHI; MIMA SATOSHI; MACHIDA YOSHIHIKO
Applicant: KYODO YUSHI
Category: C10M169/04; C10M173/00

PROBLEM TO BE SOLVED: To provide a metal-working oil excellent in machinability, defoamability, stock solution stability, emulsion stability and hydrolysis resistance, and low in dynamic viscosity at low temperatures. ; SOLUTION: The metal-working oil includes: (A) a base oil containing 2-ethylhexanol palmitate or stearate; and (B) an anionic surfactant composed of a salt of a 8-18C branched aliphatic carboxylic acid and a 3-12C branched alkanolamine.

34-- PATENT: PROCESS FOR MAKING POLYOL ESTERS WITH IMPROVED COLOUR AND ODOUR QUALITY

Patent number: US2011251383 (A1)
Publication date: 2011-10-13
Inventor: MAINX HANS-GEORG [DE]; HOFER PETER [DE]; BUSCH STEFAN [DE]; MAHNKE EIKE ULF [DE]
Applicant: COGNIS IP MAN GMBH [DE]
Category: C07H13/06; C10M105/38; C07C67/03

Suggested is an improved process for making polyol esters with improved colour quality by transesterification of polyols or their alkoxylation products with fatty acid alkyl esters, which is characterised in that the reaction is carried out in the presence of a reducing mineral or organic acid as a catalyst selected from the group consisting of (i) sulphuric or sulphonic acids with an oxidation value of sulphur of less than 6 or their salts, and/or (ii) phosphoric or phosphonic acids with an oxidation value of phosphor of less than 5 or their salts.

35-- TECHNICAL SIDE: ALTERNATIVE ECO-FRIENDLY LUBES FOR CLEAN TWO-STROKE ENGINES

Tribology International
Volume 44, Issue 6, Pages 727-736, June 2011
A. Igartua, R. Nevshupa, X. Fernandez, M. Conte, R. Zabala, J. Bernaola, P. Zabala, R. Luther, J. Rausch

High performance lubricant for clean two-stroke engines operating with ethanol-containing fuels was developed by the selection of the optimal synthetic esters base oil followed by an improvement of the additives composition. The developed lubricant has very good wear resistance, ashless and low carbon soot deposit formation. The lubricant has low toxicity for aqueous organisms (algae and Daphnia Magna) and high biodegradability. Good wear resistance and low friction were achieved because of formation of a protective transparent friction lacquer on the contact surface due to tribochemical reactions.

36-- TECHNICAL SIDE: TEMPERATURE DEPENDENCE OF THE OXIDATIVE STABILITY OF CORN OIL AND POLYALPHAOLEFIN IN THE PRESENCE OF SULFIDES

Thermochimica Acta
Volume 513, Issues 1-2, Pages 94-99, 20 January 2011
Grigor B. Bantchev, Girma Biresaw, Abdellatif Mohamed, Jill Moser

The effect of sulfide-modified corn oil (SMCO) and ditertiary dodecyl pentasulfide (PS) additives on the oxidative stability of corn oil (CO) and polyalphaolefin oil (PAO) was investigated using pressurized differential scanning calorimetry in dynamic (DDSC) and isothermal (IDSC) modes. DDSC showed a weak pro-oxidant effect of SMCO and PS in CO, and antioxidant behavior in PAO. Analysis of the IDSC data showed the existence of isokinetic temperature in both oils. Below the isokinetic temperature the sulfides behaved as antioxidants while above it they behaved as pro-oxidants. The isokinetic temperature was found to depend on the chemical structure of the oils. For the highly unsaturated CO, the isokinetic temperature was 100–135 °C, while for the fully saturated PAO it was above 200 °C. The existence of isokinetic temperature provides consistent explanation to our and literature data for oxidation behaviors of sulfide additives in oils, which appears to be contradictory (pro-oxidant vs. antioxidant) depending on experimental conditions. The isokinetic temperature suggests that accelerated oxidation test methods at elevated temperatures are poor predictors of the low-temperature performance of sulfide-containing antioxidants.

37-- TECHNICAL SIDE: USE OF CHITIN, CHITOSAN AND ACYLATED DERIVATIVES AS THICKENER AGENTS OF VEGETABLE OILS FOR BIO-LUBRICANT APPLICATIONS

Carbohydrate Polymers
Volume 85, Issue 3, Pages 705-714, 1 June 2011
R. Sánchez, G.B. Stringari, J.M. Franco, C. Valencia, C. Gallegos

This work deals with the development of new gel-like formulations prepared from natural resources, which could be potentially applicable as environmentally friendly lubricating greases. In particular, the use of chitin, chitosan and acylated derivatives as thickener agents of vegetable oils, which may represent an alternative to the traditional metallic soaps or polyurea derivatives, was explored. Biopolymers used to obtain oleogels were chemically and thermally characterized. Oleogels thermal and rheological behaviours were studied by means of TGA and DSC tests, and linear viscoelasticity measurements, respectively. Moreover, some lubricant performance properties were evaluated. The evolution of linear viscoelasticity functions with frequency was very similar to that found for standard lubricating greases. In general, linear viscoelasticity functions increased with biopolymer concentration, whilst they decreased when acylated chitosan or soybean oil were used in the oleogel formulation. The use of acylated chitosan with a degree of acylation of around 0.3 provides oleogels with very similar rheological properties than those shown by traditional lubricating greases, as a consequence of reducing the biopolymer polarity. However, chitin and chitosan-based oleogels show higher thermal stabilities than formulations containing acylated chitosan. In general, oleogel samples studied exhibited values of the friction coefficient comparable to those found for standard lithium greases. However, most of these oleogels generally display a quite poor mechanical stability in rolling elements.

38-- TECHNICAL SIDE: THERMAL AND MECHANICAL CHARACTERIZATION OF CELLULOSIC DERIVATIVES-BASED OLEOGELS POTENTIALLY APPLICABLE AS BIO-LUBRICATING GREASES: INFLUENCE OF ETHYL CELLULOSE MOLECULAR WEIGHT

Carbohydrate Polymers
Volume 83, Issue 1, Pages 151-158, 1 January 2011
R. Sánchez, J.M. Franco, M.A. Delgado, C. Valencia, C. Gallegos

This work deals with the design of new gel-like formulations based on blends of cellulosic derivatives and castor oil, which could be potentially applicable as environmentally-friendly lubricating greases. In particular, the influence of ethyl cellulose molecular weight, blended with α-cellulose or methylcellulose, on the thermal and rheological properties of the resulting gel-like dispersions was explored. Thermal and rheological behaviours were characterized by means of TGA tests and linear viscoelasticity (SAOS) measurements. Moreover, some standard mechanical tests, usually performed on commercial lubricating greases, were carried out in order to evaluate the suitability of these oleogels for lubricant applications. From the experimental results obtained, it can be deduced that SAOS functions of gel-like dispersions are not significantly influenced by ethyl cellulose molecular weight below a critical threshold value (Mw < 70,000 g/mol). On the contrary, a significant increase in both SAOS functions is noticed when using ethyl cellulose with Mw values higher than the critical one. Moreover, temperature does not have a large influence on oleogels SAOS functions, which is opposite to the behaviour found with standard lubricating greases. Formulations containing methylcellulose/ethyl cellulose blends show excellent mechanical stability parameters, enhanced by increasing ethyl cellulose molecular weight. On the other hand, all the oleogel formulations studied display much higher decomposition temperatures than standard lubricating greases, independently of ethyl cellulose molecular weight.

39-- TECHNICAL SIDE: FORMULATION OF NEW BIODEGRADABLE LUBRICATING GREASES USING ETHYLATED CELLULOSE PULP AS THICKENER AGENT

Journal of Industrial and Engineering Chemistry
Volume 17, Issues 5-6, Pages 818-823, September-November 2011
J.E. Martín-Alfonso, N. Núñez, C. Valencia, J.M. Franco, M.J. Díaz

The influence of cellulose pulp ethylation processing conditions has been evaluated to design suitable renewable and ◂biodegradable▸ lubricating greases from cellulose pulp-based gel-like dispersions. Ethyl/glucose molar ratio (E/G) has a positive effect on the ethyl groups degree of substitution (DS). Gel-like ◂biodegradable▸ dispersions of cellulose pulp in castor oil have been prepared by adding ethylated cellulose samples differing in the substitution degree to modify the rheological properties of castor oil. The rheology of ethyl cellulose/castor oil binary systems is highly influenced by DS. The linear viscoelastic functions and consistency are very similar to those found in traditional lithium lubricating greases.

40-- TECHNICAL SIDE: RHEOLOGY OF NEW GREEN LUBRICATING GREASE FORMULATIONS CONTAINING CELLULOSE PULP AND ITS METHYLATED DERIVATIVE AS THICKENER AGENTS

Industrial Crops and Products
In Press, Corrected Proof, Available online 17 August 2011
N. Núñez, J.E. Martín-Alfonso, C. Valencia, M.C. Sánchez, J.M. Franco

This work is focused on the development of gel-like formulations, potentially applicable as biodegradable lubricating greases obtained by dispersing eucalyptus Kraft cellulose pulp, or its methylated derivative, in an ethyl cellulose/castor oil medium. The effects that concentration and weight ratio of the different cellulosic derivatives exert on the rheological properties, thermal resistance and mechanical stability of these oleogels were studied. The evolution of linear viscoelasticity functions with frequency was very similar to that found for traditional lubricating greases. In general, linear viscoelastic functions increase with Kraft cellulose pulp or methylcellulose concentrations and ethyl cellulose/Kraft cellulose pulp weight ratio. However, the relative elasticity of gel-like dispersions based on ethyl cellulose/Kraft cellulose pulp is not affected by the composition of these thickener blends, which allows the application of an empirical superposition method to obtain generalized master curves for describing the viscoelastic response of these formulations. On the contrary, the relative elasticity of methylcellulose-based gel-like dispersions depends on the composition of methylated cellulose pulp/ethyl cellulose blends. An Arrhenius-type equation can be used to quantify the linear viscoelastic functions thermal dependence of these gel-like dispersions. Moreover, formulations prepared using Kraft cellulose pulp/ethyl cellulose blends show appropriate mechanical stabilities to be used as bio-lubricating greases.

41-- TECHNICAL SIDE: BIOLUBRICANT SYNTHESIS USING IMMOBILISED LIPASE: PROCESS OPTIMISATION OF TRIMETHYLOLPROPANE OLEATE PRODUCTION

Process Biochemistry, Volume 46, Issue 12, p 2225-2231, December 2011

Cecilia Orellana Åkerman, Anna E.V. Hagström, M. Amin Mollaahmad, Stefan Karlsson, Rajni Hatti-Kaul

Synthetic esters based on polyols and fatty acids possess suitable technical and ecological properties for applications as biolubricants, and can replace the mineral oil based lubricants in several applications. In this work, the synthesis of trimethylolpropane (TMP) esters with oleic acid using immobilised lipase B from Candida antarctica (Novozym®435) has been studied. TMP-trioleate has suitable properties for use as hydraulic fluids, especially at extreme temperatures. The effect of different reaction parameters on the reaction efficiency has been evaluated. The study showed that the formation of the triester product was facilitated at high temperature and biocatalyst concentration, as well as stoichiometric amounts of oleic acid and TMP. The product with the highest triester content exhibited the lowest pour point (−42 °C). The stability of the biocatalyst was however limited at high temperature and polyol concentration. Loss of activity during recycling of the biocatalyst at 70 °C was reduced to some extent by washing it with 2-propanol prior to subsequent run.

42-- TECHNICAL SIDE: CLEAN SYNTHESIS OF BIOLUBRICANTS FOR LOW TEMPERATURE APPLICATIONS USING HETEROGENEOUS CATALYSTS

Journal of Molecular Catalysis B: Enzymatic

Volume 72, Issues 3-4, Pages 263-269, November 2011

Cecilia Orellana Åkerman, Yasser Gaber, Noraini Abd Ghani, Merja Lämsä, Rajni Hatti-Kaul

Biolubricants derived from vegetable oils are environmentally compatible products due to their low toxicity and good biodegradability. Synthetic esters based on polyols and fatty acids possess suitable properties for lubricant applications, even at extreme temperatures. In this work, synthesis of esters from trimethylolpropane (TMP) and

carboxylic acids from C5 to C18 has been studied and compared using different heterogeneous catalysts (silica–sulphuric acid, Amberlyst-15, and immobilised lipase B from *Candida antarctica*). Silica–sulphuric acid was found to be the most efficient catalyst followed by Amberlyst-15, especially when using short chain carboxylic acids. The reaction efficiency decreased with increasing alkyl chain length. On the other hand, the immobilised lipase (Novozym®435) did not exhibit any activity with C5 acid and the activity increased with increase in length of the fatty acid chain. For synthesis of C18-ester, the biocatalytic production turned out to be comparable to silica–sulphuric acid, and moreover led to a better quality of the final product. The products showed suitable cold-flow properties for application at low temperature. A general trend of increasing pour point (−75 °C to −42 °C) and viscosity index (80–208) with increase in alkyl chain of the carboxylic acid from C5 to C18 was observed. The synthesis of TMP-trioleate using the solid acid catalysts and the biocatalyst was compared using the freeware package EATOS (environmental assessment tool for organic synthesis) and showed the enzymatic route to have the least environmental impact.

43-- TECHNICAL SIDE: SYNTHESIS OF TRIMETHYLOLPROPANE ESTERS WITH IMMOBILIZED LIPASE FROM CANDIDA SP. 99–125

Journal of Molecular Catalysis B: Enzymatic
Volume 74, Issues 3-4, Pages 151-155, February 2012
Yifeng Tao, Biqiang Chen, Luo Liu, Tianwei Tan

The lubricants of the future have to be more environmentally adapted, have a higher level of performance. Synthesis esters (SEs) which can be used as raw materials for biodegradable lubricant base oils are increasing in popularity due to superior technical properties. Direct esterification of trimethylolpropane (TMP) with fatty acid in a solvent free system, by immobilized lipase from Candida sp. 99–125 was studied. Investigations of important factors were carried out involving temperature, time, enzyme amount, substrates molar ratio and water content. For 2 g caprylic acid, under the optimal conditions, with 0.4 g immobilized lipase, at substrates molar ratio 1:10 (TMP to acid), temperature 40 °C and water content controlled under 0.8% (w/w), the total conversion of fatty acid with TMP reached up to 96% and the formation of trisubstituted TMP esters reached 93%. Water content controlled during esterification process was found to be critical for high yield of direct esterification.

44-- TECHNICAL SIDE: SYNTHESIS AND PHYSICAL PROPERTIES OF PETROSELINIC BASED ESTOLIDE ESTERS

Industrial Crops and Products
Volume 33, Issue 1, Pages 132-139, January 2011
Steven C. Cermak, Terry A. Isbell, Roque L. Evangelista, Burton L. Johnson

A new series of petroselinic (Coriandrum sativum L.) based estolide 2-ethylhexyl (2-EH) esters were synthesized, as the capping material varied in length and in degrees of unsaturation, in a perchloric acid catalyzed one-pot process with the esterification process incorporated into an in situ second step to provide the coriander estolide 2-EH ester. The kinematic viscosities ranged from 53 to 75 cSt at 40 °C and 9.1 to 14.6 cSt at 100 °C with a viscosity index (VI) ranging from 151 to 165. The caprylic (C8) capped coriander estolide 2-EH ester had the lowest low-temperature properties (pour point = −33 °C and cloud point = −33 °C), while the coco-coriander estolide 2-EH ester produced an estolide with modest low-temperature properties (pour point = −24 °C and cloud point = −25 °C). The coco-coriander estolide 2-EH ester was explored for the

ability to resist oxidative degradation with the use of an biodegradable additive package added in 1.5%, 3.5%, or 7.0% units based on weight. The oxidative stability increased as the amount of stability package increased (rotating pressurized vessel oxidation test (RPVOT) times 65–273 min). Along with expected good biodegradability, these coriander estolide 2-EH esters had acceptable properties that should provide a specialty niche in the U.S. as a biobasedlubricant.

45-- TECHNICAL SIDE: MICRO- AND NANO-TRIBOLOGICAL BEHAVIOR OF SOYBEAN OIL-BASED POLYMERS OF DIFFERENT CROSSLINKING DENSITIES

Tribology International
Volume 43, Issue 11, Pages 2231-2239, November 2010
S. Bhuyan, S. Sundararajan, D. Andjelkovic, R. Larock

Biobased polymers produced from renewable and inexpensive natural resources, such as natural oils, have drawn considerable attention over the past decades, due to their low cost, ready availability, environmental compatibility, and their inherent biodegradability. In this study, the micro/nanotribological wear behavior of biopolymers with different crosslinking densities prepared from low saturated soybean oil (LSS) by cationic copolymerization with divinyl benzene and polystyrene are evaluated and compared. Microtribological measurements were performed using a ball-on-flat reciprocating microtribometer using two different probes −1.2 mm radius Si3N4 spherical probe and a 100 μm radius conical diamond probe with 90° cone angle. Nanoscale wear tests were performed using a DLC coated antimony (n) doped silicon probe of radius <200 nm in an atomic force microscope (AFM). Wear volumes were estimated from AFM topography maps of groove geometry and wear coefficients were evaluated for the materials. Elastic modulus and hardness information were evaluated using nanoindentation tests. Correlations between crosslinking density and observed wear behavior across scales are discussed. These results provide some insight into the wear behavior of soybean oil-based polymers.

46-- TECHNICAL SIDE: EXPERIMENTAL INVESTIGATIONS OF VEGETABLE BASED CUTTING FLUIDS WITH EXTREME PRESSURE DURING TURNING OF AISI 304L

Tribology International
Volume 44, Issue 12, Pages 1864-1871, November 2011
Babur Ozcelik, Emel Kuram, M. Huseyin Cetin, Erhan Demirbas

Experimental studies on the performances of both new developed environmental friendly vegetable based cutting fluids (refined sunflower and canola oils) including different percentage of extreme pressure (EP) additive and two commercial cutting fluids (semi-synthetic and mineral cutting fluids) in turning processes were reported in this work. Performances of cutting fluids were compared with respect to surface roughness, cutting and feed forces and tool wear during longitudinal turning of AISI 304L. Experimental results were also compared with dry cutting conditions. The results indicated that 8% of EP included canola based cutting fluid performed better than the rest.

47-- TECHNICAL SIDE: APPLICATION OF VEGETABLE OIL-BASED METALWORKING FLUIDS IN MACHINING FERROUS METALS - A REVIEW

International Journal of Machine Tools and Manufacture
Volume 52, Issue 1, Pages 1-12, January 2012
S.A. Lawal, I.A. Choudhury, Y. Nukman

The increasing attention to the environmental and health impacts of industrial activities by governmental regulations and by the growing awareness level in the society is forcing industrialists to reduce the use of mineral oil-based metalworking fluids as cutting fluid. Cutting fluids have been used extensively in metal cutting operations for the last 200 years. In the beginning, cutting fluids consisted of simple oils applied with brushes to lubricate and cool the machine tool. As cutting operations became more severe, cutting fluid formulations became more complex. There are now several types of cutting fluids in the market and the most common types can be broadly categorized as cutting oils or water-miscible fluids. In this review, the applicability of vegetable oil-based metalworking fluids in machining of ferrous metals has been undertaken. The advantages of metalworking fluids and its performances with respect to the cutting force, surface finish of work piece, tool wear and temperature at the cutting zone have been investigated. It has been reported in various literature that metalworking fluids, which are vegetable oil-based, could be an environmentally friendly mode of machining with similar performance obtained using mineral oil-based metalworking fluids.

48-- TECHNICAL SIDE: CASTOR OIL-BASED LUBRICANT REDUCES SMOKE EMISSION IN TWO-STROKE ENGINES

Industrial Crops and Products
Volume 33, Issue 2, Pages 287-295, March 2011
A.K. Singh

Smoky emissions from two-stroke gasoline engines (2T) are a problem for the environment. Use of vegetable oil (oxygenate) is one solution. A biodegradable 2T-oil was developed from castor oil, which consisted of tolyl monoesters and performance additives but no miscibility-solvent. Evaluation revealed that on one hand it reduced smoke by 50–70% at 1% oil fuel ratio and on the other hand it was at par with standard product specification. Starting problems, piston-seizer or any other driving problems were not observed during the test. There is excellent potential for castor oil based biodegradable 2T-lubricant as a smoke pollution reducer.

49-- TECHNICAL SIDE: BIOASSAY TECHNIQUE USING SEED SHRIMPS FOR COMPARATIVE STUDIES REGARDING THE AQUATIC ACUTE LETHALITY OF BIODEGRADABLE LUBRICANTS

Ecotoxicology and Environmental Safety
Volume 74, Issue 6, Pages 1578-1585, September 2011
S. Tamura, S. Ezoe, C. Sasaki

To evaluate the environmental load resulting from the spillage of biodegradable lubricants in aquatic systems, a comparative acute lethality test wherein an oil–water interfacial area could be examined was considered. In this study, oleic acid was employed as a model biodegradable lubricant. Measurements of the pH value and dissolved oxygen (DO) level of water during the exposure tests indicate that water degradation depends on the oil–water interfacial area, exposure duration, and water temperature. Furthermore, 72 h acute lethality tests were performed using two types of freshwater ostracods (seed shrimps) as test organisms: the large species Stenocypris hislopi and the small species Cypretta seurati. The longevity of the small species, which was physically more active, was strongly affected by water pollution. During the exposure test, the DO in water was significantly consumed by the degradation of the lubricant floating on it. Water exposed to a lubricant containing copper (Cu) demonstrated strong toxicity even after the recovery of the pH value and DO level by aging. The decrease in the DO level of

water and increase in the concentration of metal compounds are dominant factors responsible for the mortality of aquatic organisms.

50-- TECHNICAL SIDE: THE PHYSICOCHEMICAL AND TRIBOLOGICAL PROPERTIES OF OLEIC ACID BASED TRIESTER BIOLUBRICANTS

Industrial Crops and Products
Volume 34, Issue 1, Pages 1089-1096, July 2011
Nadia Salih, Jumat Salimon, Emad Yousif

Currently, increasing pollutants in the environment lead to an increase in the use of plant oil based biolubricants. These products could lead to a significant reduction in environmental pollution and thus contribute to the discovery of a replacement for petroleum-based lubricants. Plant oils are advantageous because they are rapidly biodegradable, renewable, excellent lubricants and inexpensive to produce. However, these oils show poor stability to oxidation and unfavorable properties at low temperatures. Thus, this work outlines modifications in the epoxidation, oxirane ring opening, esterification and acylation reactions used to produce oleic acid based triester derivatives. These products have improved physicochemical and tribological properties that make them good biolubricant base stock candidates. Octyl 9-(lauroyloxy)-10-(behenoxy)octadecanoate 22 has the lowest pour point (−45 °C) while octyl 9-(lauroyloxy)-10-(octyloxy)octadecanoate 16 has the highest onset temperature. Based on the results, an increase in mid chain substituent length improves the pour point and anti-wear properties but conversely lowers the onset temperature

51-- TECHNICAL SIDE: THE TRIBOLOGICAL CHEMISTRY OF THE TRIAZINE DERIVATIVE ADDITIVES IN RAPE SEED OIL AND SYNTHETIC DIESTER

Applied Surface Science
Volume 257, Issue 9, Pages 3843-3849, 15 February 2011
Rui Qiao, Jing Li, Hua Wu, Tianhui Ren, Yidong Zhao, Chenyan Ma

The additives, laurylamino-methylthio-1,3,5-triazine-2,4-dithiol (referred to as TRLA) and diisooctylamino-methylthio-1,3,5-triazine-2,4-dithiol (referred to as TREA), were prepared in our laboratory. The products were characterized by means of infrared spectroscopy (IR) and elemental analysis. Their tribological behaviors as additives in raped seed oil and diester were evaluated using four-ball friction and wear testers as well. The results suggest that all the synthesized compounds have excellent tribological behaviors and they were compared with sulfurized isobutene (referred to as SIB) which is a commercial additive. The results show that they have good tribological properties. The two additives were investigated on thermal films and tribofilms by using X-ray absorption near edge structure (XANES) spectroscopy. The results of surface analysis reveal that the thermal films formed from TREA and TRLA in rape seed oil (referred to as RSO) and diester (referred to as DE), all are consist of iron sulfate; under mild AW conditions, the tribofilms from TRLA and TREA in DE is mainly composed of FeS, while the tribochemcal film from TRLA in RSO is mainly composed of iron sulfite; under EP-1 (the maximum non-seizure load) conditions, the tribochemical films from TRLA and TREA in RSO and DE mainly consist of FeS and FeSO4; under EP-2 (nearly weld load) conditions, the tribochemical films from TRLA and TREA in RSO and DE mainly consist of FeS.

52-- TECHNICAL SIDE: BIOLUBRICANT BASESTOCKS FROM CHEMICALLY MODIFIED RICINOLEIC ACID

Journal of King Saud University - Science
Volume 24, Issue 1, Pages 11-17, January 2012

Jumat Salimon, Nadia Salih, Emad Yousif

This paper presents a series of chemically modified biolubricant basestocks derived from ricinoleic acid. The reactions were monitored and products were confirmed by NMR and FTIR. The synthesis protocol is carried out in three stages: (1) epoxidation of ricinoleic acid; (2) synthesis of 10,12-dihydroxy-9-acyloxystearic acid from epoxidized ricinoleic acid; (3) esterification of the acyloxystearic acid products with 2-ethylhexanol to yield 2-ethylhexyl-10,12-dihydroxy-9-acyloxystearate. The viscosity index, flash point, pour points (PP), and oxidative stability of the resulting products were measured. The resulting esters could plausibly be used as bio-based industrial materials in biolubricants, surfactants, or fuel because they have improved physicochemical properties.

53-- TECHNICAL SIDE: OPTIMIZATION OF THE OXIRANE RING OPENING REACTION IN BIOLUBRICANT BASE OIL PRODUCTION

Arabian Journal of Chemistry, In Press, Accepted Manuscript, Available online 28 November 2011

Jumat Salimon, Bashar Mudhaffar Abdullah, Nadia Salih

This study has successfully optimized the conversion of monoepoxide linoleic acid (MEOA) into biolubricant via oxirane ring opening reaction using oleic acid (OA) with p-toluene sulfonic acid (PTSA) as a catalyst. The four main factors were studied according to a D-optimal design at three levels. These factors were OA/MEOA ratio, PTSA/MEOA ratio, temperature and reaction time. This analysis evidenced the best operating conditions of the oxirane ring opening reaction performed at the following condition; OA/MEOA ratio of 0.30:1 (w/w), PTSA/MEOA ratio of 0.50:1 (w/w), reaction temperature at 110 °C and reaction time at 4.5 h, an optimum yield of 84.61% and OOC of 0.05%. This model results showed a good agreement with the predict value, demonstrating that this methodology may be useful for industrial process optimization.

54-- TECHNICAL SIDE: CHEMICALLY MODIFIED BIOLUBRICANT BASESTOCKS FROM EPOXIDIZED OLEIC ACID: IMPROVED LOW TEMPERATURE PROPERTIES AND OXIDATIVE STABILITY

Journal of Saudi Chemical Society
Volume 15, Issue 3, Pages 195-201, July 2011

Jumat Salimon, Nadia Salih, Emad Yousif

Synthetic biolubricant basestocks with improved low temperature and oxidative stability were prepared by chemical modification of epoxidized oleic acid (EOA). Preparation, characterization and physico-chemical properties of mono, di and triester derivatives of 9,10-dihydroxyoctadecanoic acid after the epoxidation of oleic acid, opening of the formed oxirane ring in suitable medium, esterification of carboxylic acid hydroxyl group and acetylation of free hydroxyl group is discussed in this paper. Removal of the double bond from fatty acid acyl group, increase of the molar weight and change of molecular structure resulted in the increase of viscosity index and oxidation stability of synthetic esters.

55-- TECHNICAL SIDE: SYNTHETIC BIOLUBRICANT BASESTOCKS BASED ON ENVIRONMENTALLY FRIENDLY RAW MATERIALS

Journal of King Saud University – Science
In Press, Corrected Proof, Available online 24 February 2011

Nadia Salih, Jumat Salimon, Emad Yousif

This work outlines modifications in the epoxidation, oxirane ring opening, estrification and acylation reactions to produce oleic acid based triester derivatives. Measuring of pour point (PP), flash point (FP), viscosity index (VI), oxidation onset temperature (OT) and signal maximum temperature (SMT) was carried out for each compound. The resulting product structures were confirmed by NMR and FTIR spectroscopic analysis. The results showed that butyl 9-(decanoyloxy)-10-(behenoxy)octadecanoate with bulky ester behenyl mid chain exhibited the most favorable low-temperature performance (PP −47 °C). On the other hand, butyl 9-(decanoyloxy)-10-(octyloxy)octadecanoate exhibited higher oxidation stability (OT 173 °C) than the other synthetic esters. In conclusion, an increase in mid chain substituent length improves the PP and conversely lowers the OT.

56-- TECHNICAL SIDE: VISCOSITY AND WORKING EFFICIENCY ANALYSIS OF SOYBEAN OIL BASED BIO-LUBRICANTS

Measurement
Volume 44, Issue 8, Pages 1337-1341, October 2011
Chen-Ching Ting, Chien-Chih Chen

This article presents significant data about viscosity and working efficiency analysis for developing the soybean oil based bio-lubricants. A suitable viscosity or viscosity index (VI) plays a very important role in a lubricant, which can avoid collision and rubbing between components of mechanical devices in work as well as optimize working efficiency of a machine. In general, low friction between devices can increase working efficiency of a machine, but low viscosity of a lubricant will easily cause collision and rubbing between components of mechanical devices in work. A too viscous lubricant also requires a large amount of energy to move, but a too thin lubricant will easily cause rubbed devices and increased friction. To replace the mineral oils and syntholubes, the soybean oil is recently become one of the most actively studied oils due to its eco-friendly organic property and lower cost. This work used mixtures of the original soybean oil, the epoxidized soybean oil, and the hydrogenated soybean oil as the base oils. Applications are focused on developing engine bio-lubricants. The results show that the epoxidized soybean oil has extremely large viscosity in comparison with the engine lubricants as well as the original soybean oil, whereas the hydrogenated soybean oil is clearly opposite. This viscosity analysis offers good informations to fit viscosity of the engine lubricants by mixing the three soybean oils as base oils.

57-- TECHNICAL SIDE: DEVELOPMENT OF ECOFRIENDLY/BIODEGRADABLE LUBRICANTS: AN OVERVIEW

Renewable and Sustainable Energy Reviews
Volume 16, Issue 1, Pages 764-774, January 2012
Ponnekanti Nagendramma, Savita Kaul

Synthetic and vegetable oil based esters offer the best choice in formulating environment friendly ◂ubricants▸. In the present review an attempt has been made to highlight some recent developments in the area of biodegradable synthetic ester base stocks for formulation of new generation ◂ubricants▸ including the efforts made so far at the author's laboratory in this direction. The developed products find applications in automotive transmission fluids, metal working fluids, cold rolling oils, fire resistant hydraulic fluids, industrial gear oils, neat cutting oils and automotive gear ◂ubricants▸ either alone or in formulations.

58-- TECHNICAL SIDE: EXPERIMENTAL EVALUATION OF PALM OIL AS LUBRICANT IN COLD FORWARD EXTRUSION PROCESS

International Journal of Mechanical Sciences
Volume 53, Issue 7, Pages 549-555, July 2011
S. Syahrullail, B.M. Zubil, C.S.N. Azwadi, M.J.M. Ridzuan

Today, vegetable oil is much desired for its application as a lubricant in metal forming processes, because it is a renewable resource and has high biodegradability compared to mineral oil. According to the Organization for Economic Cooperation and Development for the European Union 301C (OECD) testing method, the biodegradability levels of vegetable oils are better compared to petroleum-based lubricants. Palm oil is used more often than other vegetable oils. Therefore, palm oil has the potential to fulfill the demand for vegetable-based lubricants. The purpose of this paper is to evaluate the viability of palm oil when used as a lubricant in cold work such as the forward plane strain extrusion process. The performances of palm oil were compared with additive-free paraffinic mineral oil. Experimental work with a plane strain extrusion apparatus with a symmetrical workpiece was carried out at room temperature. The material of the workpiece is annealed pure aluminum A1100. The visioplasticity method was used to calculate the velocities and effective strain in the deformation zone of the workpiece. The results obtained from the experimental work showed that palm oil has satisfactory lubrication performances, as compared to paraffinic mineral oil, and has advantages in reducing the extrusion load.

59-- TECHNICAL SIDE: ASSESSMENT OF BIODEGRADABILITY AND OXIDATION STABILITY OF MINERAL, VEGETABLE AND SYNTHETIC OIL SAMPLES

Industrial Crops and Products
Volume 33, Issue 3, Pages 579-583, May 2011
F. Murilo T. Luna, Breno S. Rocha, Estélio M. Rola Jr., Mônica C.G. Albuquerque, Diana C.S. Azevedo, Célio L. Cavalcante Jr.

This study proposes to evaluate rapid methodologies to estimate oxidative stability and biodegradability for mineral, vegetable and synthetic oil samples, using quick and simple experiments. The synthetic oil sample was obtained from castor oil, so the vegetable oil chosen for this evaluation was a sample of the crude castor oil source. The oxidative stability tests described enabled the comparison of synthetic lubricant samples and showed that their stability was lower than that of petroleum-based oil. However, the physico-chemical properties, such pour points and viscosity index, were improved and potentially interesting for lubricant applications. The biodegradability experiments were carried out using a model of bio-kinetics. These studies proved that synthetic lubricant samples were easily degradable (similar to crude castor oil) and showed half-life significantly lower than those of the mineral oil samples.

60-- TECHNICAL SIDE: LUBRICATING AND WAXY ESTERS, I. SYNTHESIS, CRYSTALLIZATION, AND MELT BEHAVIOR OF LINEAR MONOESTERS

Chemistry and Physics of Lipids
Volume 165, Issue 1, Pages 38-50, January 2012
Laziz Bouzidi, Shaojun Li, Steve Di Biase, Syed Q. Rizvi, Suresh S. Narine

Four pure jojoba wax-like esters (JLEs), having carbon chain length of 36, 40 (two isomers) and 44, were prepared by Steglish esterification of fatty acids (or acid chlorides) with fatty alcohols at room temperature. Calorimetric and diffraction data was used to elucidate the phase behavior of the esters. The primary thermal parameters

(crystallization and melting temperatures) obtained from the DSC of the symmetrical molecules correspond well with the carbon numbers of the JLEs. However, the data also suggests that carbon number is not the only factor since the symmetry of the molecule also plays a significant role in the phase behavior. Overall, the JLEs show very little polymorphic activity at the experimental conditions used, suggesting that they are likely to transform the same way during melting as well as crystallization, a characteristic which may be useful in designing new waxes and lubricants. The XRD data clearly show that the solid phase in all samples consists of a mixture of a β-phase and a β′-phase; fully distinguishable by their characteristic diffraction peaks. Subtle differences between the subcell patterns and phase development of the samples were observed. Different layering of the samples was also observed, understandably because of the chain length differences between the compounds. The long spacings were perfectly linearly proportional to the number of carbon atoms. The length of the ester layers with n carbon atoms can be calculated by a formula similar to that used for the layers in linear alkane molecules.

61-- TECHNICAL SIDE: 10-UNDECENOIC ACID-BASED POLYOL ESTERS AS POTENTIAL LUBRICANT BASE STOCKS

Industrial Crops and Products
Volume 35, Issue 1, Pages 237-240, January 2012
Korlipara V. Padmaja, Bhamidipati V.S.K. Rao, Rondla K. Reddy, Potula S. Bhaskar, Arun K. Singh, Rachapudi B.N. Prasad

A new class of polyol esters were prepared by esterification of 10-undecenoic acid (UDA) with three polyols namely trimethylolpropane (TMP), neopentyl glycol (NPG) and pentaerythritol (PE) in 92–96% yields. The esters were characterized by IR, 1H NMR, HPLC and mass spectral studies. Polyol esters were evaluated for basic lubrication properties and found to be: viscosity at 40 °C, 11.2–36.1 cSt; at 100 °C, 3.2–7.3 cSt; viscosity index (VI), 162–172; pour point +3 to −36 °C; flash point, 254–296 °C. All the three polyol esters synthesized exhibited good thermal stability with TGA onset temperatures above 260 °C. The lubricating properties of the products compared well with polyol esters based on oleic acid.

62-- TECHNICAL SIDE: METABOLIC ENGINEERING OF HIGHER PLANTS TO PRODUCE BIO-INDUSTRIAL OILS

Comprehensive Biotechnology (Second Edition)
Volume 4, Pages 67-85, 2011
D.C. Taylor, M.A. Smith, P. Fobert, E. Mietkiewska, R.J. Weselake

Vegetable oils have enormous potential as alternatives and replacements for mineral oil in a myriad of industrial applications. Although our knowledge of the genes and biochemical pathways leading to the formation of plant oils allows for the potential to engineer a diverse array of lipid products in seed oils, this goal remains a challenge. This article first summarizes current industrial uses of plant oils while highlighting features that make them attractive for industrial applications and presents a general overview of seed oil biosynthesis. Thereafter, the article considers various metabolic engineering strategies to achieve desired fatty acid compositions of seed oils for industrial applications. Among the target modifications examined are fatty acid chain length, level of desaturation, and the presence of novel functional groups, which are introduced within the endoplasmic reticulum. The role of triacylglycerol assembly in accommodating industrially useful fatty acyl groups is also addressed. In addition, a section is devoted to

examining the manipulation of key steps in carbon flow to increase seed oil content. The concept of producing oil in vegetative tissues is also addressed, as is the development of crop 'platforms' for the production of metabolically engineered bio-industrial oils. Finally, this article examines the potential of waxes for industrial applications, which require lubricants that are more stable to hydrolysis at higher temperatures.

63-- TECHNICAL SIDE: INTERFACIAL PROPERTIES OF OLEOSINS AND PHOSPHOLIPIDS FROM RAPESEED FOR THE STABILITY OF OIL BODIES IN AQUEOUS MEDIUM

Colloids and Surfaces B: Biointerfaces
Volume 80, Issue 2, Pages 125-132, 15 October 2010
Magali Deleu, Guadalupe Vaca-Medina, Jean-François Fabre, Julie Roïz, Romain Valentin, Zéphirin Mouloungui

Oleosins are plant proteins associated with phospholipids in seed oil bodies. The ability of oleosins to aid in the emulsification and stabilization of oil bodies is well known, but little information is available on their interaction with phospholipids at the interface between oil bodies and aqueous medium. Oil body reconstitution at various phospholipid/oleosin ratios was carried out to observe how rapeseed oleosins of 20 kDa and rapeseed phospholipids affect oil body stability. Phospholipids are needed to stabilize oil droplets, but oleosins are mandatory to avoid coalescence. We thus characterized how phospholipids affect the interfacial properties of oleosins at pHs 5.5 and 8.5, by analyzing the adsorption kinetics and interfacial dilational rheology. We observed a synergic effect between oleosins and phospholipids in increasing surface pressure at both pHs. This kind of effect was also observed for the dilational modulus at pH 5.5. A thermodynamic approach highlights these synergic interactions between oleosins and phospholipids through a positive deviation from ideality.

64-- LCA: LIFE CYCLE ASSESSMENT OF MINERAL OIL-BASED AND VEGETABLE OIL-BASED HYDRAULIC FLUIDS INCLUDING COMPARISON OF BIOCATALYTIC AND CONVENTIONAL PRODUCTION METHODS

The International Journal of Life Cycle Assessment
Volume 16, Number 4, Pages 297 – 305, 25 February 2011
Anna Ekman & Pål Börjesson

Background, aim and scope

Lubricants are used in numerous applications in our society, for instance, as hydraulic fluids. When used in forestry, 60–80% of these hydraulic fluids are released into the environment. This is one of the reasons for the growing interest for developing and utilising hydraulic fluids with good environmental performance. Another driving force in the development of hydraulic fluids is to replace fossil products with renewable ones. The aim of this paper is to investigate the environmental impact of two types of hydraulic fluids, one based on mineral oil and one on vegetable oil. The difference in environmental impact of using chemical or biocatalytic production methods is also assessed.

Materials and methods

This life cycle assessment is from cradle-to-gate, including waste treatment. A complementary, laboratory, biodegradability test was also performed. The functional unit is 1 l of base fluid for hydraulic fluids, and mass allocation is applied. A sensitivity analysis is performed to assess the impact of the energy used and of the allocation method. The impact categories studied are primary energy consumption, global warming

potential (GWP), eutrophication potential (EP), acidification potential (AP), photooxidant creation potential (POCP) and biodegradability.

Results and discussion

The contribution to GWP and primary energy consumption was higher for the mineral oil-based hydraulic fluid than the vegetable oil-based hydraulic fluids. The contributions to EP and AP were higher for the vegetable oil-based hydraulic fluid than the mineral oil-based one. The vegetable oil-based hydraulic fluid had better biodegradability than the one based on mineral oil. The impact of production method was minor, thus the biocatalytic method gives no significant advantage over chemical methods concerning energy and environmental performance.

Conclusions

For the environmental impact categories GWP, POCP and primary energy consumption, hydraulic fluids based on rapeseed oil make a lower contribution than a mineral oil-based hydraulic fluid. For EP and AP, the contributions of TMP oleate are higher than the contribution of mineral oil-based hydraulic fluid. The difference between the chemically catalysed method and the ezymatically catalysed method is negligible because the major environmental impact is due to the production of the raw materials. The vegetable oil-based hydraulic fluid, TMP oleate, was more biodegradable than the mineral oil-based hydraulic fluid.

65-- POLICY: THE LEAD MARKET INITIATIVE: A EUROPEAN STANDARD FOR BIOLUBRICANTS

In the framework of the Lead Market Initiative for bio-based products, the European Commission has in 2008 issued a standardisation mandates for biolubricants. CEN has accepted the mandate and integrated the work into a new working group, WG 33 (Bio-based lubricants) under the responsibility of TC 19 (Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin).

WG33 has worked to prepare a Technical Report (TR). This TR was published in August 2011 as CEN/TR 16227:2011 "Liquidpetroleum products - Bio-lubricants - Recommandation for terminology and characterisation of bio-lubricants and bio-based lubricants". The technical report is available in English and in German.

66-- LEGISLATION: WALLOON FOREST CODE: PROPOSAL OF IMPLEMENTATION DECREE

In Wallonia, a new Forest Code was adopted on July 15, 2008 by the Walloon parliament. This new Forest Code offers the possiblity of enforcing the use of bio-based lubricants for chain saw and forest exploitation equipments. But up to now, there is no execution order. Back in June, ValBiom sent a proposal of implementation decree (including criteria, controls, etc...) to the Walloon Ministry of Agriculture (the proposal focuses on chainsaw oils only).

67-- ON THE WEB: NORTH AMERICAN BIOLUBRICANTS MARKET TO REACH 243,327 TONNES BY 2017, ACCORDING TO A NEW REPORT BY GLOBAL INDUSTRY ANALYSTS, INC (GIA).

Back in April, GIA announced the release of a comprehensive North American and European report on Biolubricants market entitled "Biolubricants: A North American and European Market Report". North American biolubricants market is forecast to reach 243,327 tonnes by the year 2017, spurred by legislative initiatives, sustained demand from hydraulic fluids market and growth potential of product types, bio 2 cycle engine

oils, greases and concrete release agents in the long-term. Currently, biolubricants usage is primarily restricted to developed markets of North America and Europe, with lack of awareness and high pricing posing major hurdles to widespread appeal and usage in other parts of the world. In the future, increasing environmental concerns and emphasis on shift from non-biodegradable lubricants to the environmentally safe and 'green' biolubricants will drive high-powered growth.
North America and Europe represent two of the largest markets worldwide, as stated by the new research report on Biolubricants. Increasing activity in the manufacturing and auto industries is a major growth impetus for the industrial lubes market, translating into higher demand for segments and applications. The Hydraulic Fluids segment constitutes the most important product line in both the regions. Environmental regulations and fiscal incentives drive the market, with strong growth indications for the hydraulic fluids and cutting oil segments. The Bio 2 Cycle Engine Oils segment is poised to deliver robust growth of more than 12% through 2017 in the North American biolubricants market.
Key market participants profiled in the report include BP Plc, BP Lubricants USA, Inc., Chevron Corporation, Cargill, Incorporated., ExxonMobil Corporation, Esso S.A.F, Eurol BV., Fuchs Petrolub AG, Henkel Corporation, KAJO Chemie GmbH, Miller Oils Ltd., Falcon Lubricants Ltd, Neatsfoot Oil Refineries Corporation, Panolin AG, Renewable Lubricants Inc., Royal Dutch Shell Plc., SOPUS Products, Suncor Energy Inc., Statoil Lubricants, Total S.A., Valvoline and Welch Holme & Clark Co., Inc.
The research report titled "Biolubricants: A North American and European Market Report" announced by Global Industry Analysts, Inc., provides a comprehensive review of industry overview, market drivers, trends & issues, biodegradable lubricants, segment analysis, regulatory environment, product innovations, recent industry activity and profiles of market players worldwide. Analysis and overview is provided in both volume (tonnes) and value (US$) terms for major geographic markets such as North America and Europe. Market analytics for the North American market are provided for product segments including Bio 2 Cycle Engine Oils, Chainsaw Oil, Concrete Release Agents, Gear Oils, Greases, Hydraulic Fluids and Metal Working Fluids. The study also presents historic data for an insight into market evolution over the period 2003 through 2008.
For more details about this market research report:
http://www.strategyr.com/Biolubricants_Market_Report.asp.

68-- ON THE WEB: NEW EUROPEAN PROJECT ON BIOLUBRICANTS

The VOSOLUB project (New formulation of sunflower based bio-lubricants with high oleic acid content) is a project co-funded by the European Union within the CIP Eco-Innovation initiative of the Competitiveness and Innovation Framework Programme (CIP).
This demonstration project aims at testing under real operating conditions new formulations of sunflower-based biolubricants with high oleic acid content. These biolubricant formulations (including hydraulic fluids, greases, and neat oil metal-working fluids) will be tested in three European demonstrating sites. Their technical performance and environmental impacts will be evaluated and compared to corresponding mineral lubricants ones. In order to cover the demand for the sunflower base oil, a European SMEs network will be established to ensure the supply of the base at a competitive market price.
The formulations that will be evaluated in VOSOLUB project have been previously developed in the framework of the FP6 IBIOLAB project using base oils derived from a mild refining process for raw materials developed by the project partner ITERG and from new varieties of vegetable oils with higher oxidative stability. The new process coupled

with the use of new varieties of vegetable oil enabled to decrease the overall cost and to increase the technical performance of the bio-lubricants. The developed formulations were very promising some of which could be eco-labelled.
(Duration of the project: 01/10/2011-31/11/2013)

69-- ON THE WEB: AMYRIS AND COSAN ESTABLISHING JV FOR PRODUCTION AND COMMERCIALISATION OF RENEWABLE BASE OILS

On 15 December 2010, US Biotech Company Amyris and Cosan (one of the world's leading producers of sugar and ethanol from sugarcane) executed a binding agreement to establish a joint venture for the worldwide development, production and commercialization of renewable base oils.
By applying Amyris's synthetic biology platform to modify yeast to produce targeted hydrocarbon molecules, the joint venture will be able to create base oils from plant sugar sources. The Cosan/Amyris joint venture plans to use sugarcane as a feedstock in a standard fermentation process in which Amyris's modified yeast converts the cane syrup to farnesene which is a sesquiterpene (Biofene™). Biofene is then finished chemically to create high-end base oils. These base oils are designed to reduce smoke and odor and also reduce greenhouse gas emissions by over 80% compared with petroleum-sourced base oils. In addition, they are biodegradable, perform well in cold weather and have high-performance viscosity properties.
Amyris and Cosan executed the JV Implementation Agreement in June 2011 with the formation of NOVVI SA.

70-- ON THE WEB: ALBERMALE TO MANUFACTURE FIRST SYNTHETIC RENEWABLE BASE OILS FROM AMYRIS BIOFENE® FOR NOVVI SA

On 23 August 2011, Albemarle Corporation, a global developer, manufacturer and marketer of highly engineered specialty chemicals announced it entered into a manufacturing agreement to supply base oils to NOVVI S.A. (the joint venture between Amyris and Cosan focused on the development, production, marketing and distribution of high-performance renewable base oils from Biofene®, Amyris' renewable farnesene) (see article 68 above).
Under the terms of the agreement, Albemarle's Fine Chemistry Services (FCS) Division will serve as a custom scale-up and production partner for synthetic, renewable base oils for the lubricants market. NOVVI will market NovaSpec™, the venture's synthetic renewable base oils produced at Albemarle, to finished lubricant manufacturers globally.
Pending regulatory activities, Albemarle expects to commence production of NovaSpec™ base oils at its Orangeburg, South Carolina facility utilizing Biofene produced and supplied by Amyris.
The press release is available at:
http://www.albemarle.com/_filelib/FileCabinet/Literature_Library/Fine_Chemistry_Literature/Fine_Chemistry_Services/FINAL_ALB-Amyris_Agreement_Press_Release.pdf

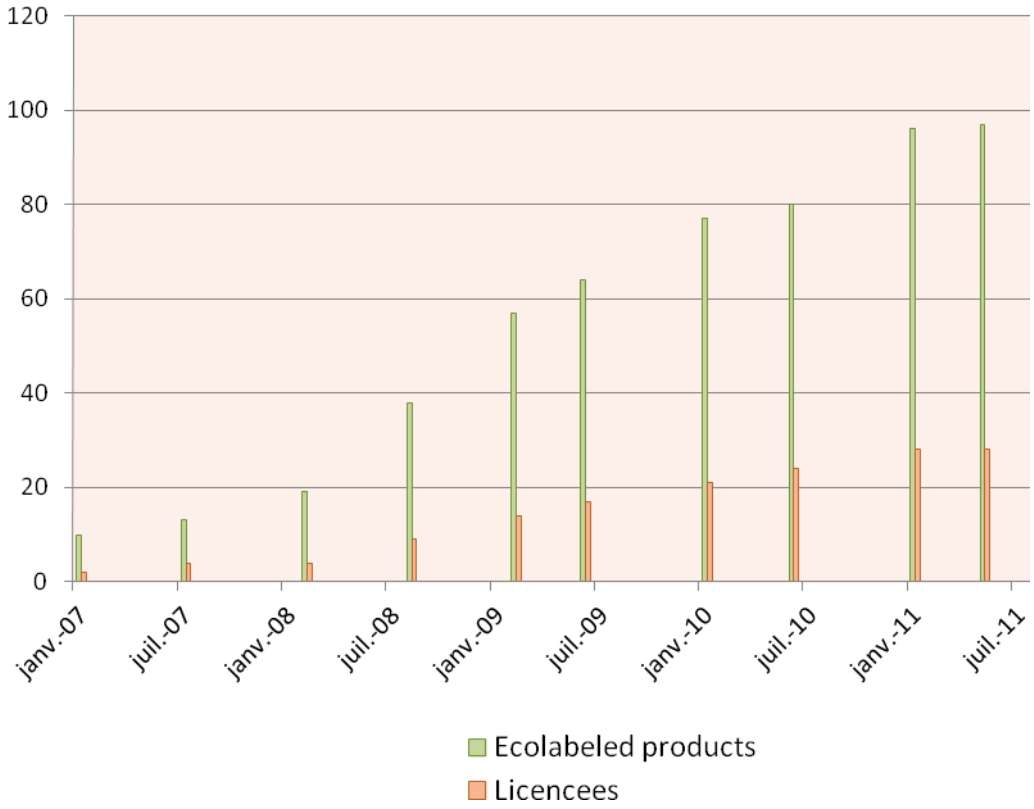
71-- ON THE WEB: SOLAZYME AND DOW FORM AN ALLIANCE FOR THE DEVELOPMENT OF MICRO ALGAE-DERIVED OILS FOR USE IN BIO-BASED DIELECTRIC INSULATING

On 9 March 2011, Solazyme, Inc., a leading renewable oils and bioproducts company, announced the execution of both a joint development agreement (JDA) and a letter of intent (LOI) with The Dow Chemical Company to advance the development of Solazyme's

algal oils for use in next generation, bio-based dielectric insulating fluids key to transformers and other electrical applications.
Under the terms of the joint development agreement, Dow will combine its extensive knowledge of specialty fluid formulations and dielectric insulation capabilities with Solazyme's unique feedstock capabilities to develop of a new class of algal oils tailored for optimized performance and cost in dielectric insulating fluid applications. The non–binding LOI provides that Dow may obtain up to 20 million gallons of Solazyme's oils for use in dielectric insulating fluids and other industrial applications in 2013 and up to 60 million gallons in 2015.
Solazyme Chief Executive Officer and Co-founder, Jonathan Wolfson, commented: "In this initial joint effort Dow and Solazyme will work to tap into the >500 million gallon dielectric insulating fluids market with novel and breakthrough bio-based solutions."
Dow Wire & Cable General Business Manager Tim Laughlin, added: "Solazyme is a leading company in the industrial biotechnology space and its renewable oil technology platform provides a unique opportunity to significantly improve the next generations of chemical solutions." On the specifics of the opportunity Laughlin further explained, "In the fast growing space of bio-based dielectric insulation fluids, Solazyme tailor-designed algal oils will serve as a foundation to develop a new generation of fluids that are fire safe, environmentally sound, and that provide overall increased performance to users of transformers and other electrical applications."

72-- ECO-LABELS IN EUROPE: THE EU ECO-LABEL

The new EU Ecolabel criteria for lubricants were published in the Official Journal of the European Union on 29 June 2011 (notified under document C(2011)4447).
The new criteria are valid until 24 June 2015. The new applications included in the revised version of the European Ecolabel are tractor transmission oils, stern tube oils and greases, wire rope lubricants, industrial and marine gear oils.
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011D0381:EN:NOT
There are presently 28 companies that produce 97 ecolabeled products (of which some are different viscosities of the same product). At present these products comprise all together: 61 hydraulic oils, 18 chain saw oils, 7 two stroke oils, 6 greases, 2 concrete release agents and 3 niche loss lubricants.
The progress made since 2007 is illustrated in the figure below. After a slow start, in 2008 the number of lubricants awarded with the flower increased largely reflecting the increasing interest for ecolabeled lubricants.


120
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Ecolabeled products
Licencees

73-- ECO-LABELS IN EUROPE: LIST OF LUBRICANT SUPPLIERS THAT GOT LICENSES (UPDATED 12 DECEMBER 2011)

	Swedish Standard *Hydraulic oils* **SS 15 54 34**	**Swedish Standard** *Lubricating Greases* **SS 15 54 70**	**Nordic Swan**	**BLUE ANGEL** *Hydraulic Fluids* **RAL-UZ 79**	**BLUE ANGEL** *Lub. and Form. Oils* **RAL-UZ 64**	**EUROPEAN ECO-Label**
1					~~Addinol Lube Oil~~	
2	Agro Oil	Agro Oil				
3						Andreas Stihl
4					Aral	
5				Avia Mineralöl		
6					BASF Pers. Care	
7					Bau + Metallchemie	
8				BayWa	BayWa	
9	Bechem (Carl)			Bechem (Carl)		Bechem (Carl)
10	Binol	Binol				Binol Biosafe (FIN)
11						Bioil
12						~~Biostar oil~~
13				BP Europa SEBP Europa SE		Blaser Swisslube
14	~~BP Smörjmedel~~			BP Schmierstoff		
15				Bremer & Leguil		
16	Canadian Oil AB					
17				Calpam Mineralöl		
18	~~Castrol~~					
19	Cargo Oil	Cargo Oil				
20	~~Caterpillar~~					Caterpillar
21	Cognis Deutsch.			Cognis Deutsch.	~~Cognis~~	Cognis
22						Condat
23						De Oliebron
24	Eliassons Maskin					
25					ELASKON SACHSEN	
26				Eni		

				Schmiertechnik GmbH		
27						Envirosys
28				Esso Deutschland		Esso Deutshland
29						Eurol bv
30	Exxon Mobil Lub.					
31				FINKE Mineralölw.	FINKE Mineralölw.	
32	F L Nordic (Ambra)					
33				Fragol Schmierstoff	Fragol Schmierstoff	
34		Fuchs		Fuchs	Fuchs	Fuchs
35	G. A. Lindberg					
36	Green Oils					
37	Gulf Oil international					
39				Handelsges. für Kr.	Handelsges. für Kr.	
40					Hebro Chemie	
41					Hunold Schmierstoffe	
42						~~Husqvarna austria~~
43	Hydroscand					
44						Interflon
45	John Deere Forestry					
46	Kajo-Chemie			Kajo-Chemie	Kajo-Chemie	Kajo-Chemie
47					Kettlitz Chemie	Kettliz Chemie
48	Komatsu Forest					
49						KROON OIL
50						Lubrizol
51					Mastertec	
52					Matzke (Roland)	
53	Matrix Lubricants					Matrix Lubricants
54					mbg d.o.o.	
55					MC-Bauchemie Müller	
56		MCB Larsson Mill.				

57	Midland	Midland				
58	Mobil Oil					
59	Morris lubricants					
60				Motorex		
61				Motul BP 94		Motul
62					Natoil AG	
63	Neste Oil AB	Neste Oil AB				
64	Nordisk Däck.(Agip)					
65						
66						Novance (FR)
67	NYCO.					NYCO
68	OK-Q8	OK-Q8				
69						OMV Refining and marketing
70						Oy voitelukeskus tontilla
71						Pakelo Motor Oil
72	Panolin Scandinav.			Panolin	Panolin AG	Panolin AG
73	Petronas					
74	Preem Pet (Texaco)					
75		Ramby Oljor& Verk.				
76	Rottne Industri					
77	Skand. Oljecentr.					
78		SKF Maint. Prod.				
79	Shell AB	Svenska Shell			Shell Deutshland	
80				Schörling Fahrzugbau Haüslingen Gmbh		
81					Starke & Sohn	
82	Statoil Lubricants	Statoil Lubricants				
83		S.T.L. Lubricants				
84	~~Sunoco~~					
85					Technolub Schmier	

86	Total Lub.Sweden					TOTAL
87					Trennfit GmbH & Co.Bauindustrie KG	
88	Valvoline Intern.					
89				Veba Oel Vertrieb		
90	Voitel. Tont.					
91				Voith TURBO GmbH &Co.KG		
92	Volvo CE			Volvo CE Intern.		
93				Zeller & Gmelin	Zeller & Gmelin	Zeller & Gmelin
94						
Status Sept. 2010	37 companies	13 companies	0 companie	23 companies	24 companies	25 companies
	83 products	20 products	0 products	73 products	49 products	87 products
Status Dec. 2011	34 companies (+1;-4)	13 companies	0 companie	24 companies (+1)	24 companies (+2 ;-2)	28 companies (+5;-2)
	80 products	20 products	0 products	75 products	49 products	97 products

74—ECO-LABELS IN EUROPE: EVOLUTION OF COMPANIES AWARDED WITH AN ECO-LABEL (FROM JANUARY 2007 TO DECEMBER 2011)