What is claimed is:

1. A lubricating oil composition comprising:

a. an oil of lubricating viscosity, and

b. from 0.1 to 20 wt. % of a polymeric surfactant compound comprising an acylated polymer wherein the polymer comprises a branched olefin containing 8 to 30 carbon atoms, and combinations thereof, and the polymer has a number average molecular weight (Mn) of 500 to 50,000 Da.

2. The lubricating composition of claim 1, wherein the acylated polymer is further reacted with an amine or alcohol to form an imide, amide, ester and combinations thereof.

3. The lubricating composition of claim 1, wherein the polymer is represented by formula:

$$-[T]_n-[Z]_m-$$

wherein,

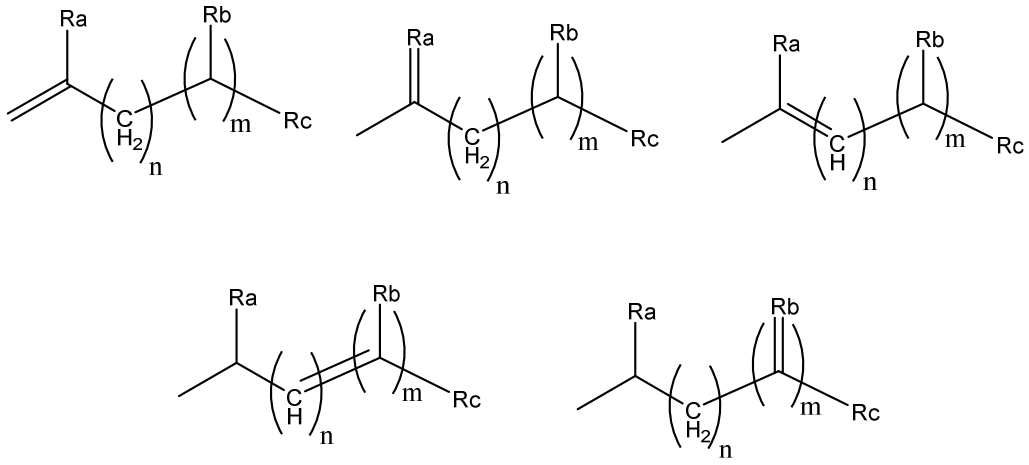
[T] is a branched olefin having 8 to 30 carbon atoms;

[Z] is a vinyl monomer capable of polymerizing with the branched olefin; and

m is 0 to 100 and n is at least 1 or is at least 2 when m = 0.

4. The lubricating composition of any one of the preceding claims, wherein the branched olefin comprises an oligomer or polymer of at least one lower olefin monomer unit containing 5 to 10 carbon atoms.

5. The lubricating composition of any one of the preceding claims, wherein the lower olefin monomer is represented by one of the following formulas:

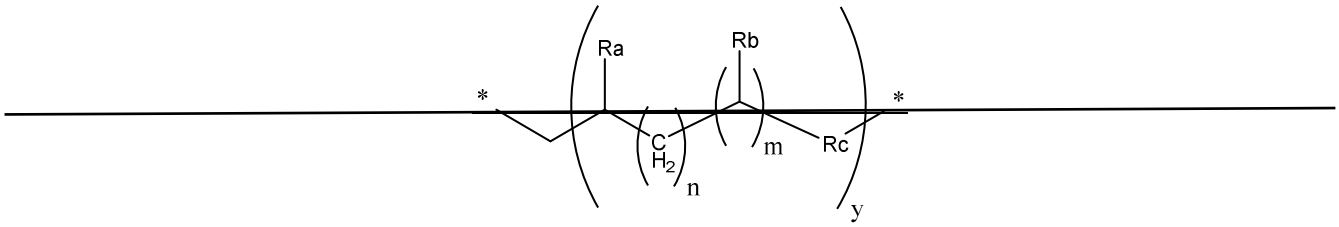


where,

Ra, Rb, and Rc can be H or a C_1 to C_5 alkyl;

n and m can be, independently, integers of 0 to 6, with the proviso that n+m is from 1 to 6.

~~6. The lubricating composition of any one of the preceding claims, wherein the branched olefin is an oligomer of lower olefin containing 5 to 10 carbon atoms represented by the following formula:~~



~~where,~~

~~Ra, Rb, Rc are each independently H or a C_1 to C_5 alkyl, with the proviso that at least one of Ra or Rb is a C_1-C_5 alkyl,~~

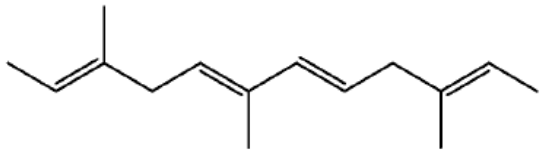
~~n and m are each, independently, integers of 0 to 6, with the proviso that n+m is from 1 to 6, and~~

~~y is an integer of 2 to 6, or 2 to 4, or 2 to 3 or is 3.~~

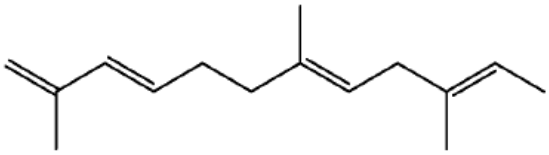
~~7. The lubricating composition of any one of the preceding claims, wherein the lower olefin monomer is a branched polyene having 5 to 10 carbon atoms.~~

~~8.~~ 6. The lubricating composition of any one of the preceding claims, wherein the lower olefin monomer is isoprene.

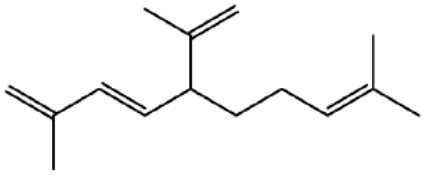
~~9.~~ 7. The lubricating composition of any one of the preceding claims, wherein the branched olefin is a trimer of isoprene represented by the following formula:



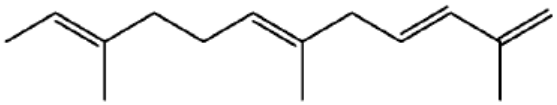
(2E,5E,7E,10E)-3,6,10-trimethyldodeca-2,5,7,10-tetraene



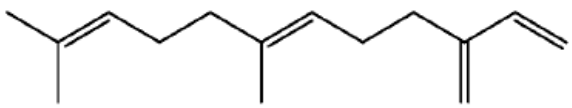
(3E,7E,10E)-2,7,10-trimethyldodeca-1,3,7,10-tetraene



(E)-2,9-dimethyl-5-(prop-1-en-2-yl)deca-1,3,8-triene

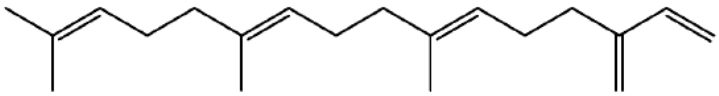


(3E,6E,10E)-2,6,10-trimethyldodeca-1,3,6,10-tretraene

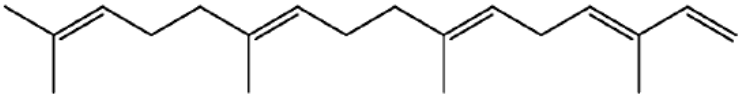


(E)-7,11-dimethyl-3-methylenedodeca-1,6,10-triene.

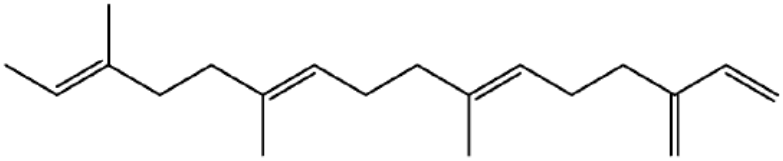
~~10.~~8. The lubricating composition of any ~~of the preceding claims~~ of claims 1 to 6, wherein the branched olefin can be tetramers of the following formula:



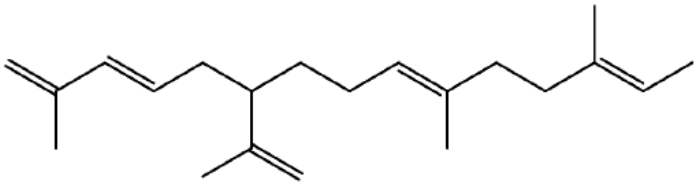
(6E,10E)-7,11,15-trimethyl-3-methylenehexadeca-1,6,10,14-tetraene



(3E,10E,14E)-3,7,11,15-tetramethylhexadeca-1,3,6,10,14-pentaene

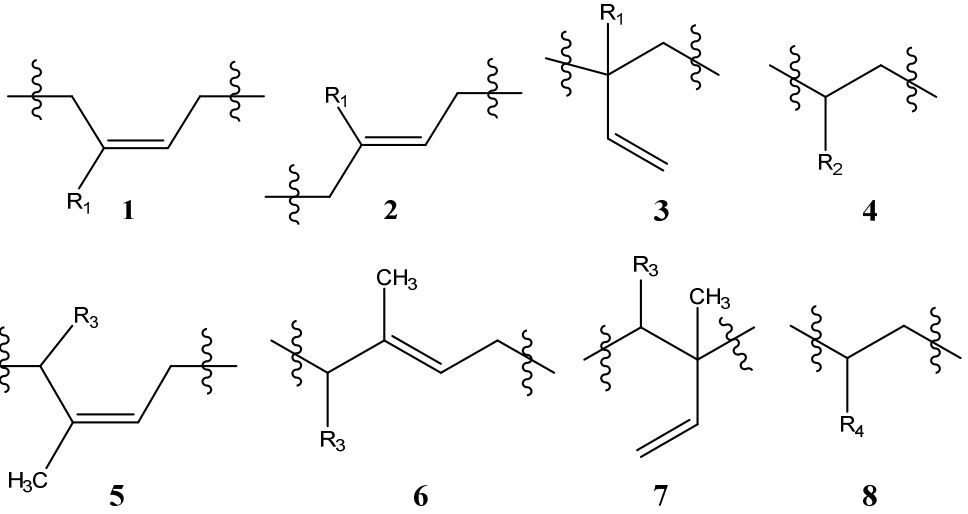


(6E,10E,14E)-7,11,14-trimethyl-3-methylenehexadeca-1,6,10,14-tetraene



(6E,9E,13E)-2,10,13-trimethyl-6-(prop-1-en-2-yl)pentadeca-1,3,9,13-tetraene

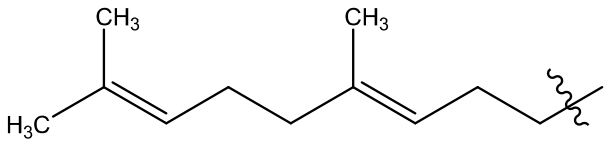
~~11.~~ 9. The lubricating composition of any one of the preceding claims, wherein the branched olefin is represented by one or more of formula (1) to (8):



,

wherein

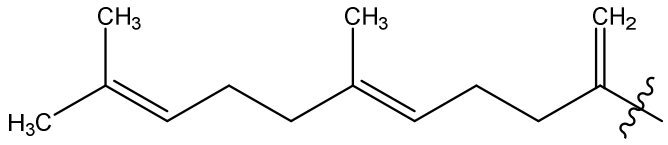
R_1 is represented by formula (9):



9

;

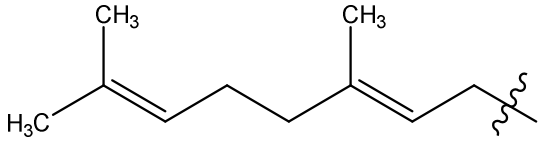
R_2 is represented by formula (10):



10

;

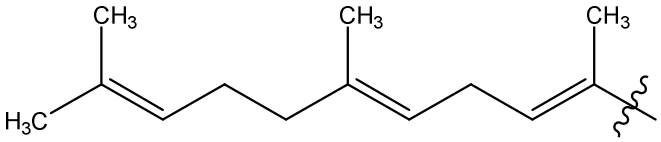
R_3 is represented by formula (11):



11

; and

R_4 is represented by formula (12):

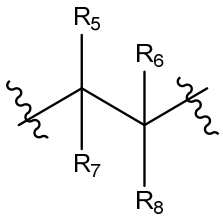


12

~~12. The lubricating composition of any one of the preceding claims, wherein the branched olefin comprises one degree of unsaturation.~~

~~13. The lubricating composition of claim 3, wherein m is at least 1.~~

~~14.~~10. The lubricating composition of any one of claims 3 to ~~13~~ 9, wherein the vinyl monomer is represented by formula (13):



13

,

wherein,

R_5, R_6, R_7 and R_8 are each independently H, alkyl, cycloalkyl, aryl, cycloalkenyl, and alkynyl.

~~15.~~ 11. The lubricating composition of any one of claims 3 to ~~13~~10, wherein the vinyl monomer is one or more of ethylene, an α-olefin, and styrene.

~~16. The lubricating composition of any one of the preceding claims, wherein the acylated polymer has an acyl group comprised of a carboxylic acid.~~

~~17. The lubricating composition of any of the preceding claims, wherein the acylated polymer is the reaction product of the polymer with an ethylenically unsaturated carboxylic acid.~~

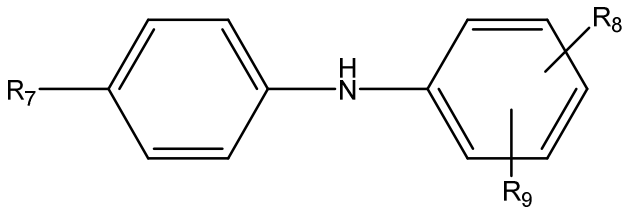
~~18. The lubricating composition of claim 17, wherein the ethylenically unsaturated carboxylic acid is maleic anhydride or reactive equivalent thereof.~~

~~19. The lubricating composition of claims 17 or 18, wherein the ethylenically unsaturated carboxylic acid is grafted onto the polymer in solution or in molten form and optionally in the presence of a free radical initiator.~~

~~20. The lubricating composition of claim 19, wherein the free radical initiator is selected from one or more of a peroxide, a hydroperoxide, and an azo compound.~~

~~21. The lubricating composition of any one of claims 2 to 20, wherein the amine is selected from one or more of an aromatic amine, an aliphatic amine, and combinations thereof.~~

~~22.~~ 12. The lubricating composition of any one of claims 2 to 11 ~~21~~, wherein the ~~aromatic~~ amine is an N-arylphenylenediamine represented by the formula:



wherein,

R_7 is H, —NHaryl, —NHalkaryl, or a branched or straight chain hydrocarbyl radical having from 4 to 24 carbon atoms being selected from an alkyl, an alkenyl, an alkoxyl, an aralkyl, or analkaryl;

R_9 is —NH_2. —$(NH(CH_2)_n)_m$ NH_2, —NHalkyl, —NHaralkyl, —CH2-aryl-NH2, in which n and m each have a value from 1 to 10; and

R_8 is H, alkyl, alkenyl, alkoxyl, aralkyl, or alkaryl, having from 4 to 24 carbon atoms.

~~23. The lubricating composition of claim 22, wherein the N-arylphenylenediamine is selected from~~

~~N-phenyl l,4-phenylenediamine,~~

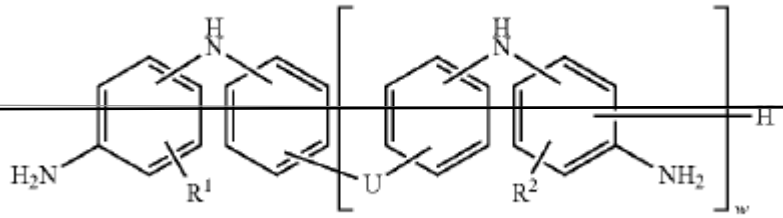
~~N-phenyl-1,3-phe-nylenediamine,~~

~~N-phenyl-l,2-phenylenediamine, and~~

~~N-naphthyl-l,4-phenylenediamine.~~

~~24. The lubricating composition of claim 21, wherein the aromatic amine is selected from aniline, N-methyl-aniline, N-butylaniline, di-(para-methylphenyl)amine, naphthylamine, 4-aminodiphenylamine, N,N-dimethylphenylenediamine, 4-(4-nitro-phenylazo)aniline (disperse orange 3), sulfamethazine, 4-phenoxyaniline, 3-nitroaniline, 4-aminoacetanilide, 4-amino-2-hydroxy-benzoic acid phenyl ester (phenyl amino salicylate), N-(4-amino-5-methoxy-2-methyl-phenyl)-benzamide (fast violet B), N-(4-amino-2,5-dimethoxy-phenyl)-benzamide (fast blue RR), N-(4-amino-2,5-diethoxy-phenyl)-benzamide (fast blue BB), N-(4-amino-phenyl)-benzamide, and 4-phenylazoaniline.~~

~~25. The lubricating composition of claim 21 wherein the aromatic amine is an amine having at least 3 or at least 4 aromatic groups and is represented by the following formula:~~



wherein,

R1 is H or a C_1 to C_5 alkyl group;

R2 is H or a C_1 to C_5 alkyl group;

U is an aliphatic, alicyclic or aromatic group, with the proviso that when U is aliphatic, the aliphatic group is a linear or branched alkylene group containing 1 to 5, or 1 to 2 carbon atoms; and

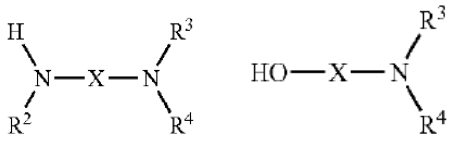
w is 1 to 10, or 1 to 4, or 1 to 2.

26. The lubricating composition of claim 21, wherein the aliphatic amine is a monoamine, diamine, or polyamine, wherein the diamine and polyamine has a single primary amino group.

27. The lubricating composition of claim 26, wherein the diamine or polyamine has a single primary amino group.

28. The lubricating composition of claim 26 or 27, wherein the diamine or polyamine is selected from dimethylaminopropylamine, diethylaminopropylamine, dibutylamine propylamine, dimethylaminoethylamine, diethylaminoethylamine, dibutylaminoethylamine, 1-(2-aminoethyl)piperidine, 1-(2-aminoethyl)pyrrolidone, N,N-dimethylethylamine; 3-(dimethylamino)-1-propylamine; N,N-dimethyldipropylenetriamine; aminoethylmorpholine; aminoethylethyleneurea; and aminopropylmorpholine.

29. 13. The lubricating composition of any one of claims 2 to 11 21 wherein the amine or alcohol is represented by the following formula:



wherein,

X is an alkylene group containing about 1 to about 4 carbon atoms;

R2, R3 and R4 are each independently hydrocarbyl groups.

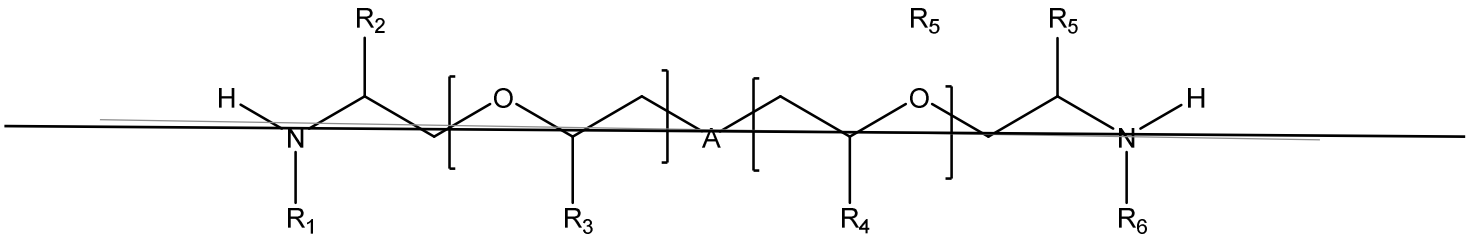
~~30. The lubricating composition of any one of claims 2 to 21, wherein the amine is a polyether amine or polyether polyamine.~~

~~31. The lubricating composition of claim 30, wherein the polyether amine contains at least one ether unit and is chain terminated with at least one amine moiety.~~

~~32. The lubricating composition of claim 30 or 31, wherein the polyether amine includes a polymer derived from a C_2-C_6 epoxide such as ethylene oxide, propylene oxide, and butylene oxide.~~

~~33. The lubricating composition of claim 30, wherein the polyether amine is a polyether aromatic amine.~~

~~34. The lubricating composition of claim 33, wherein the polyether aromatic amine is represented by the following formula:~~



~~wherein,~~

A is an aromatic aminic moiety where the ether groups are linked through at least one amine group on the aromatic moiety;

R_1 and R_6 are each independently H, alkyl, alkaryl, aralkyl, or aryl or mixtures; thereof;

R_2, R_3, R_4, and R_5 are each independently H or an alkyl containing from 1 to 6 carbon atoms of mixtures thereof; and

a and x are each independently integers from about 1 to about 50.

35. The lubricating composition of any one of claims 2 to 21, wherein the acylated polymer and the amine are reacted at a CO:N ratio of 5:1 to 1:10, 2:1 to 1:10, or 2:1 to 1:5, or 2:1 to 1:2, or 2:1 to 1:10, or 2:1 to 1:5, or 2:1 to 1:2, or 1:1.4 to 1:0.6.

36. 14. The lubricating composition of any one of the preceding claims, wherein the composition further comprises one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion inhibitors, viscosity modifiers, and combinations thereof.

37. 15. The lubricating composition of any one of the preceding claims, wherein the composition contains no more than 2 wt%, or 1.5 wt% or 1.0 wt% of a polyisobutylene based dispersant.

38. The lubricating composition of any one of the preceding claims, wherein the composition contains no more than 1wt%, or 0.5 wt%, or 0.25 wt% ethylene/propylene based viscosity modifier dispersant

39. The lubricating composition of any one of the preceding claims, wherein the oil of lubricating viscosity includes a base oil having a Kinematic Viscosity at 100 °C of 2cST to 8cSt, or 2.5cSt to 4.5cSt.

~~40. The lubricating composition of any one of the preceding claims, wherein the lubricating composition has a High Temperature High Shear (HTHS) as measured by ASTM D4683 of less than 3.5cP or less than 3cP or less than 2.5cP.~~

~~41. The lubricating composition of any one of the preceding claims, wherein the sulfur content of the lubricating composition is 1 wt% or less, or 0.8 wt% or less, or 0.5 wt% or less, or 0.3 wt % or less.~~

~~42.~~16. The lubricating composition of any one of the preceding claims, wherein the phosphorus content of the lubricating composition is 0.2 wt% or less, or 0.12 wt % or less, or 0.1 wt% or less, or 0.085 wt% or less, or 0.08 wt % or less, or even 0.06 wt% or less, 0.055 wt% or less, or 0.05 wt% or less.

~~43. The lubricating composition of any one of the preceding claims, wherein the total sulfated ash content of the lubricating composition is 2 wt% or less, or 1.5 wt% or less, or 1.1 wt% or less, or 1 wt% or less, or 0.8 wt% or less, or 0.5 wt% or less, or 0.4 wt% or less.~~

~~44.~~ 17. The lubricating composition of any one of the preceding claims, wherein the lubricating composition is an engine oil having at least one of (i) a sulfur content of 0.5 wt% or less, (ii) a phosphorus content of 0.1 wt % or less, (iii) a sulfated ash content of 1.5 wt% or less, or combinations thereof.

~~45.~~ 18. The lubricating composition of any one of the preceding claims, ~~claim 44,~~ wherein the lubricating composition is an engine oil is prepared by combining an oil of lubricating viscosity with an additive mixture, wherein the additive mixture includes:

a. a polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 300Da to about 50,000Da, or about 2000Da to about 50,000Da, or preferred about 2000Da to about 25,000Da and includes a branched olefin having from 8 to 30 carbon atoms and

b. one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion

inhibitors, viscosity modifiers, and combinations thereof, and the additive mixture without variation of the combination of additives or the relative proportions thereof within the additive mixture that meets or exceeds the performance requirements of one or more of the following engine oil certification programs: ILSAC GF-5, ILSAC GF-6, API SN, dexos, CJ-4, ACEA-A1 , ACEA-A2, ACE A- A3, ACEA-B1 , ACEA-B2, ACEA-B3, ACEA-B4, ACEA-E1 , ACEA-E2, ACEA-E3, ACEA-E4, and PC-11.

~~46. The lubricating composition of claim 44, wherein the engine oil is prepared by combining an oil of lubricating viscosity with an additive mixture, wherein the additive mixture includes:~~

~~a. a polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 500 Da to about 50,000 Da, and comprises a branched olefin having from 8 to 30 carbon atoms, and wherein the acylated polymer is further reacted with an amine or alcohol to form an amide, imide, ester or combinations thereof; and~~

~~b. one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion inhibitors, viscosity modifiers, and combinations thereof, and the additive mixture without variation of the combination of additives or the relative proportions thereof within the additive mixture that meets or exceeds the performance requirements of one or more of the following engine oil certification programs: ILSAC GF-5, ILSAC GF-6, API SN, dexos, CJ-4, ACEA-A1 , ACEA-A2, ACE A- A3, ACEA-B1 , ACEA-B2, ACEA-B3, ACEA-B4, ACEA-E1 , ACEA-E2, ACEA-E3, ACEA-E4, and PC-11.~~

~~47.~~ 19. The lubricating composition of any one of claims 1 to ~~43~~17, wherein the lubricating composition is a gear oil prepared by combining an oil of lubricating viscosity with an additive mixture, wherein the additive mixture includes:

a. a polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 300Da to about 50,000Da, or

about 2000Da to about 50,000Da, or preferred about 2000Da to about 25,000Da and comprises a branched olefin having from 8 to 30 carbon atoms; and

b. one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion inhibitors, viscosity modifiers, and combinations thereof, and the additive mixture without variation of the combination of additives or the relative proportions thereof within the additive mixture that meets or exceeds the performance requirements of one or more of the following API Gear oil categories: API GL-4, GL-5, MIL-L-2105D, MIL-PRF-2105E, MT-1, and SAE Standard J2360.

~~48. The lubricating composition of any one of claims 1 to 43, wherein the lubricating composition is a gear oil prepared by combining an oil of lubricating viscosity with an additive mixture, wherein the additive mixture includes:~~

~~a. a polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 500 Da to about 50,000 Da, and comprises a branched olefin having from 8 to 30 carbon atoms, and wherein the acylated polymer is further reacted with an amine or alcohol to form an amide, imide, ester or combinations thereof and~~

~~b. one or more additives selected from the group consisting of anti foaming agents, anti wear agents, anti oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion inhibitors, viscosity modifiers, and combinations thereof, and the additive mixture without variation of the combination of additives or the relative proportions thereof within the additive mixture that meets or exceeds the performance requirements of one or more of the following Gear oil categories: API GL-4, GL-5, MIL-L-2105D, MIL-PRF-2105E, MT-1, and SAE Standard J2360.~~

~~49. The lubricating composition of any one of claims 1 to 43, wherein the lubricating composition is an automatic transmission fluid prepared by combining an oil of lubricating viscosity with an additive mixture, wherein the automatic transmission fluid includes:~~

a. a polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 300Da to about 50,000Da, or about 2000Da to about 50,000Da, or preferred about 2000Da to about 25,000Da and comprises a branched olefin having from 8 to 30 carbon atoms; and

b. one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion inhibitors, viscosity modifiers, and combinations thereof, and the additive mixture without variation of the combination of additives or the relative proportions thereof within the additive mixture that meets or exceeds the performance requirements of one or more of the following performance categories: DEXRON ULV, MERCON ULV, Mopar ATF+4, DEXRON III/MERCON, DEXRON VI/MERCON V, MERCON V - Most Ford, Mercury, Lincoln, Mazda B Series, 2001-08 Mazda Tribute, MERCON LV, MERCON SP, Toyota ATF Type T-IV (T4), and Toyota ATF WS.

50. The lubricating composition of any one of claims 1 to 43, wherein the lubricating composition is an automatic transmission fluid prepared by combining an oil of lubricating viscosity with an additive mixture, wherein the additive mixture includes:

a. a polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 500 Da to about 50,000 Da, and comprises a branched olefin having from 8 to 30 carbon atoms, and wherein the acylated polymer is further reacted with an amine or alcohol to form an amide, imide, ester or combinations thereof and

b. one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion inhibitors, viscosity modifiers, and combinations thereof, and the additive mixture without variation of the combination of additives or the relative proportions thereof within the additive mixture that meets or exceeds the performance requirements of one or more of the following performance categories: DEXRON ULV, MERCON ULV, Mopar ATF+4, DEXRON

III/MERCON, DEXRON VI/MERCON V, MERCON V - Most Ford, Mercury, Lincoln, Mazda B-Series, 2001-08 Mazda Tribute, MERCON LV, MERCON SP, Toyota ATF Type T IV (T4), and Toyota ATF WS.

51. A method of operating an automatic transmission having a continuously variable transmissions (CVT), or an infinitely variable transmissions (IVT), or a Toroidal transmissions, or a continuously slipping torque converted clutches (CSTCC), or a stepped automatic transmissions or a dual clutch transmissions (DCT) said method comprising operating an automatic transmission with a lubricating fluid comprising an oil of lubricating viscosity with and an additive mixture, wherein the additive mixture includes:

a. a polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 500 Da to about 50,000 Da, and comprises a branched olefin having from 8 to 30 carbon atoms, and wherein the acylated polymer is further reacted with an amine or alcohol to form an amide, imide, ester or combinations thereof; and

b. one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion inhibitors, viscosity modifiers, and combinations thereof.

52. A method of operating an internal combustion engine fitted with an emission control system such as diesel particulate filters (DPF), or systems employing selective catalytic reduction (SCR), said method comprising operating the engine with a lubricating fluid comprising an oil of lubricating viscosity with an additive mixture, wherein the additive mixture includes:

a. a polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 500 Da to about 50,000 Da, and comprises a branched olefin having from 8 to 30 carbon atoms, and wherein the acylated polymer is further reacted with an amine or alcohol to form an amide, imide, ester or combinations thereof; and

~~b. one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion inhibitors, viscosity modifiers, and combinations thereof.~~

~~53. A method of operating an internal combustion engine fitted with a turbocharger, said method comprising operating the engine with a lubricating fluid comprising an oil of lubricating viscosity with an additive mixture, wherein the additive mixture includes:~~

~~a. polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 500 Da to about 50,000 Da, and comprises a branched olefin having from 8 to 30 carbon atoms, and wherein the acylated polymer is further reacted with an amine or alcohol to form an amide, imide, ester or combinations thereof; and~~

~~b. one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion inhibitors, viscosity modifiers, and combinations thereof.~~

~~54. The method of claim 52 or 53, wherein the internal combustion engine is selected from a spark ignited engine and a compression ignited engine.~~

20. The lubricating composition of any one of claims 1 to 17, wherein the lubricating composition is an automatic transmission fluid prepared by combining an oil of lubricating viscosity with an additive mixture, wherein the automatic transmission fluid includes:

a. a polymeric surfactant compound that is an acylated polymer comprising a polymer having a number average molecular weight of about 300Da to about 50,000Da, or about 2000Da to about 50,000Da, or preferred about 2000Da to about 25,000Da and comprises a branched olefin having from 8 to 30 carbon atoms; and

b. one or more additives selected from the group consisting of anti-foaming agents, anti-wear agents, anti-oxidants, demulsifiers, detergents, dispersants, extreme pressure agents, friction modifiers, metal deactivators, pour point depressants, rust and corrosion

inhibitors, viscosity modifiers, and combinations thereof, and the additive mixture without variation of the combination of additives or the relative proportions thereof within the additive mixture that meets or exceeds the performance requirements of one or more of the following performance categories: DEXRON ULV, MERCON ULV, Mopar ATF+4, DEXRON III/MERCON, DEXRON VI/MERCON V, MERCON V - Most Ford, Mercury, Lincoln, Mazda B-Series, 2001-08 Mazda Tribute, MERCON LV, MERCON SP, Toyota ATF Type T-IV (T4), and Toyota ATF WS.