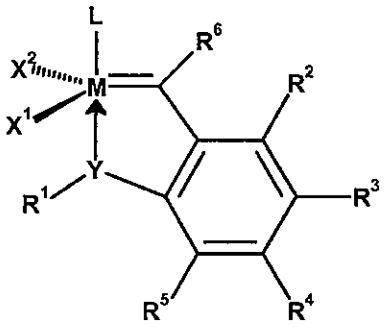
WHAT IS CLAIMED IS:

1. A process for the production of a hydrogenated nitrile rubber comprising reacting a nitrile rubber in the presence of hydrogen, optionally at least one co-olefin, and in the presence of at least one compound of the general formula (I),



(I)

where

M is ruthenium or osmium,

Y is oxygen (O), sulphur (S), an N-R^1 radical or a P-R^1 radical, where R^1 is as defined below,

X^1 and X^2 are identical or different ligands,

R^1 is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl, $CR^{13}C(O)R^{14}$ or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,

R^{13} is hydrogen or alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^{14} is alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

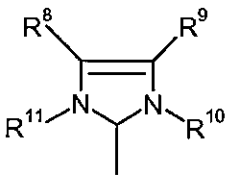
R^2, R^3, R^4 and R^5 are identical or different and are each hydrogen, organic or inorganic radicals,

R^6 is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical and

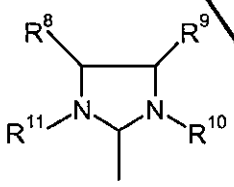
L is a ligand.

2. The process according to claim 1, wherein a catalyst of the general formula (I) is used in which the ligand L is a phosphine, a sulphonated phosphine, phosphate, phosphinite, phosphonite, arsine, stibine, ether, amine, amide, sulphoxide, carboxyl, nitrosyl, pyridine, thioether, or L is a substituted or unsubstituted imidazolidine ("Im") ligand; preferably, L is a C_6-C_{24}-arylphosphine, C_1-C_6-alkylphosphine or C_3-C_{10}-cycloalkylphosphine ligand, a sulphonated C_6-C_{24}-arylphosphine or a sulphonated C_1-C_{10}-alkylphosphine ligand, a C_6-C_{24}-aryl phosphinite or C_1-C_{10}-alkyl phosphinite ligand, a C_6-C_{24}-aryl phosphonite or C_1-C_{10}-alkyl phosphonite ligand, a C_6-C_{24}-aryl phosphite or C_1-C_{10}-alkylphosphite ligand, a C_6-C_{24}-arylarsine or C_1-C_{10}-alkylarsine ligand, a C_6-C_{24}-arylamine or C_1-C_{10}-alkylamine ligand, a pyridine ligand, a C_6-C_{24}-aryl sulphoxide or C_1-C_{10}-alkyl sulphoxide ligand, a C_6-C_{24}-aryl ether or C_1-C_{10}-alkyl ether ligand or a C_6-C_{24}-arylamide or C_1-C_{10}–alkylamide ligand, each of which may be substituted by a phenyl group which may in turn be substituted by a halogen, C_1-C_5 alkyl radical or C_1-C_5-alkoxy radical, or L is a substituted or unsubstituted imidazolidine ("Im") ligand; more preferably, L is selected from the group consisting of PPh_3, $P(p\text{-}Tol)_3$, $P(o\text{-}Tol)_3$, $PPh(CH_3)_2$, $P(CF_3)_3$, $P(p\text{-}FC_6H_4)_3$, $P(p\text{-}CF_3C_6H_4)_3$, $P(C_6H_4\text{-}SO_3Na)_3$, $P(CH_2C_6H_4\text{-}SO_3Na)_3$, $P(iso\text{-}Pr)_3$, $P(CHCH_3(CH_2CH_3))_3$, $P(cyclopentyl)_3$, $P(cyclohexyl)_3$, $P(neopentyl)_3$ and $P(neophenyl)_3$, or L is a substituted or unsubstituted imidazolidine ("Im") ligand.

3. The process according to claim 2, wherein the imidazolidine radical **(Im)** has a structure of the general formula (IIa) or (IIb),



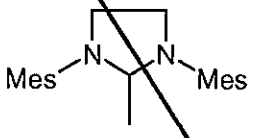
(IIa)



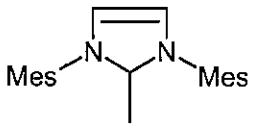
(IIb)

where

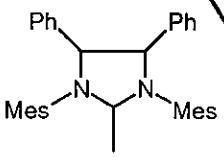
R^8, R^9, R^{10}, R^{11} are identical or different and are each hydrogen, straight-chain or branched C_1-C_{30}-alkyl, preferably C_1-C_{20}-alkyl, C_3-C_{20}-cycloalkyl, preferably C_3-C_{10}-cycloalkyl, C_2-C_{20}-alkenyl, preferably C_2-C_{10}-alkenyl, C_2-C_{20}-alkynyl, preferably C_2-C_{10}-alkynyl, C_6-C_{24}-aryl, preferably C_6-C_{14}-aryl, C_1-C_{20}-carboxylate, preferably C_1-C_{10}-carboxylate, C_1-C_{20}-alkoxy, preferably C_1-C_{10}-alkoxy, C_2-C_{20}-alkenyloxy, preferably C_2-C_{10}-alkenyloxy, C_2-C_{20}-alkynyloxy, preferably C_2-C_{10}-alkynyloxy, C_6-C_{24}-aryloxy, preferably C_6-C_{14}-aryloxy, C_2-C_{20}-alkoxycarbonyl, preferably C_2-C_{10}-alkoxycarbonyl, C_1-C_{20}-alkylthio, preferably C_1-C_{10}-alkylthio, C_6-C_{24}-arylthio, preferably C_6-C_{14}-arylthio, C_1-C_{20}-alkylsulphonyl, preferably C_1-C_{10}-alkylsulphonyl, C_1-C_{20}-alkylsulphonate, preferably C_1-C_{10}-alkylsulphonate, C_6-C_{24}-arylsulphonate, preferably C_6-C_{14}-arylsulphonate, or C_1-C_{20}-alkylsulphinyl, preferably C_1-C_{10}-alkylsulphinyl; preferably, the imidazolidine radical (Im) has a structure of the formulae (IIIa-f), where Mes is in each case a 2,4,6-trimethylphenyl radical



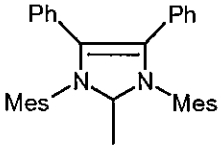
(IIIa)



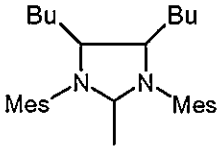
(IIIb)



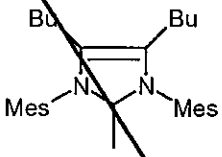
(IIIc)



(IIId)



(IIIe)

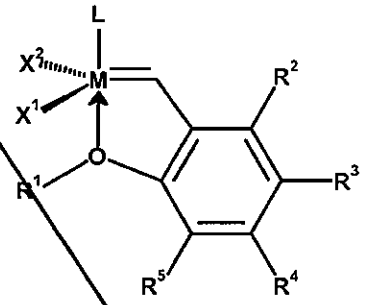


(IIIf)

4. The process according to any one of claims 1 to 3, wherein X^1 and X^2 in the catalyst of the general formulae (I) are identical or different and represent hydrogen, halogen, pseudohalogen, straight-chain or branched C_1-C_{30}-alkyl, C_6-C_{24}-aryl, C_1-C_{20}-alkoxy, C_6-C_{24}-aryloxy, C_3-C_{20}-alkyldiketonate, C_6-C_{24}-aryldiketonate, C_1-C_{20}-carboxylate, C_1-C_{20}-alkylsulphonate, C_6-C_{24}-arylsulphonate, C_1-C_{20}-alkylthiol, C_6-C_{24}-arylthiol, C_1-C_{20}-

alkylsulphonyl or C_1-C_{20}-alkylsulphinyl; preferably, X^1 and X^2 are identical or different and are each halogen, in particular fluorine, chlorine, bromine or iodine, benzoate, C_1-C_5-carboxylate, C_1-C_5-alkyl, phenoxy, C_1-C_5-alkoxy, C_1-C_5-alkylthiol, C_6-C_{24}-arylthiol, C_6-C_{24}-aryl or C_1-C_5-alkylsulphonate; more preferably, X^1 and X^2 are each halogen, in particular chlorine, CF_3COO, CH_3COO, CFH_2COO, $(CH_3)_3CO$, $(CF_3)_2(CH_3)CO$, $(CF_3)(CH_3)_2CO$, PhO, MeO, EtO, tosylate, mesylate or CF_3SO_3.

5. The process according to any one of claims 1 to 4, wherein the compound of the general formulae (I) has the following structure (IV)



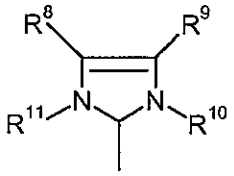
(IV)

wherein

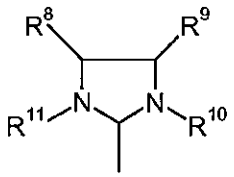
M	is ruthenium,
X^1 and X^2	are both halogen, in particular, both chlorine,
R^1	is a straight-chain or branched C_1-C_{12}-alkyl radical,
R^2, R^3, R^4, R^5	are identical or different and are each hydrogen, organic or inorganic radicals, and
L	is a ligand.

6. The process according to claim 5, wherein in the compound of formula (IV)

M	is ruthenium,
X^1 and X^2	are both chlorine,
R^1	is an isopropyl radical,
R^2, R^3, R^4, R^5	are all hydrogen and
L	is a substituted or unsubstituted imidazolidine radical of the formula (IIa) or (IIb),



(IIa)



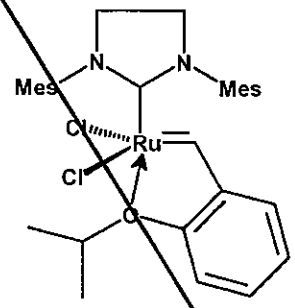
(IIb)

where

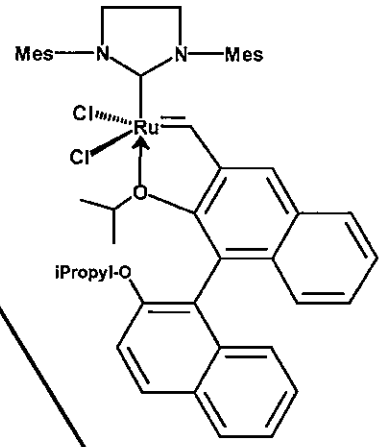
R^8, R^9, R^{10}, R^{11}

are identical or different and are each hydrogen, straight-chain or branched C_1-C_{30}-alkyl, C_3-C_{20}-cycloalkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-carboxylate, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl, C_1-C_{20}-alkylsulphonate, C_6-C_{24}-arylsulphonate or C_1-C_{20}-alkylsulphinyl.

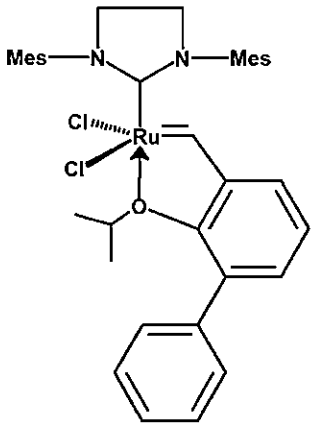
7. The process according to claim 5 or 6, wherein the compound of the formula (IV) is selected from the structures of formulae (V), (VI), (VII), (VIII), (IX), (X), (XI), (XII) and (XIII), where Mes is in each case a 2,4,6-trimethylphenyl radical



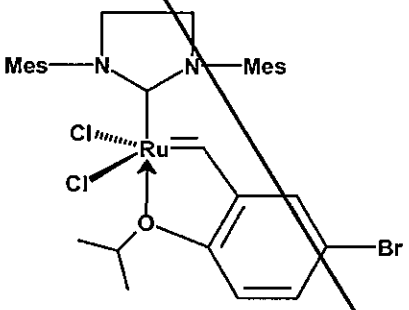
(V)



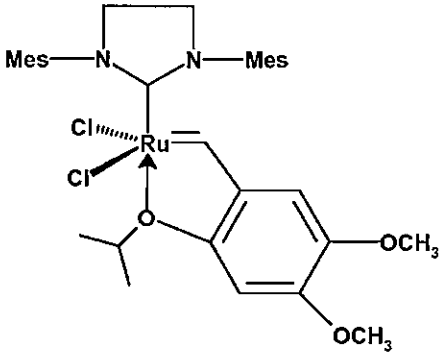
(VI)



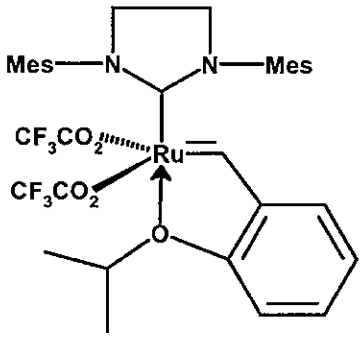
(VII)



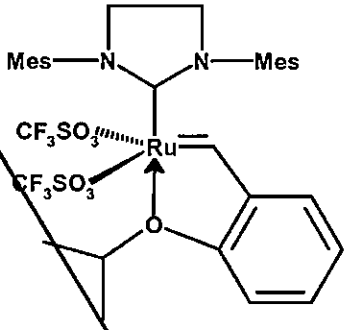
(VIII)



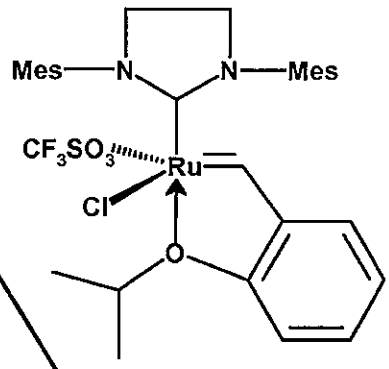
(IX)



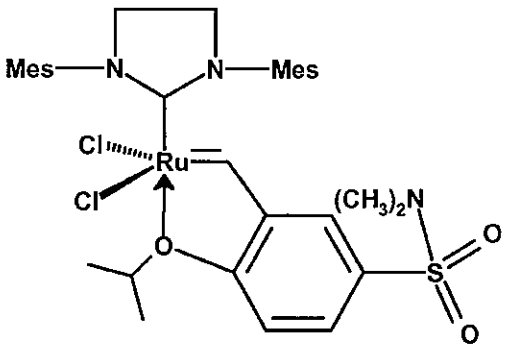
(X)



(XI)

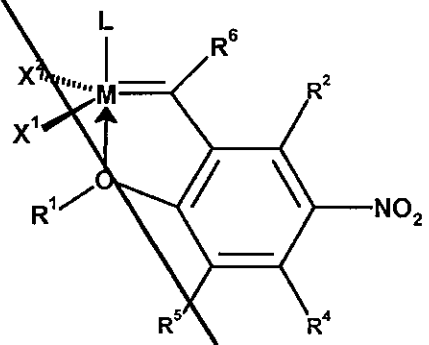


(XII)



(XIII)

8. A process according to claim 1 wherein the compound of the general formula (I) has the structure of the general formula (XIV)



(XIV)

where

M is ruthenium or osmium,

X^1 and X^2 are identical or different ligands,

R^1 is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl, $CR^{13}C(O)R^{14}$ or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,

R^{13} is hydrogen or alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may

optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^{14} is alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^2, R^4 and R^5 are identical or different and are each hydrogen, organic or inorganic radicals,

R^6 is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical, and

L is a ligand.

9. A process according to claim 8, wherein in the compounds of the general formula (XIV)

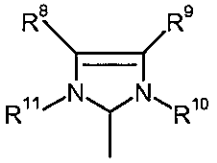
M is ruthenium,

X^1 and X^2 are both chlorine,

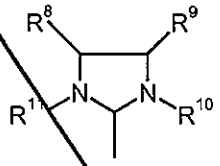
R^1 is an isopropyl radical,

R^2, R^4 and R^5 are each hydrogen and

L is a substituted or unsubstituted imidazolidine radical of the formula (IIa) or (IIb),



(IIa)



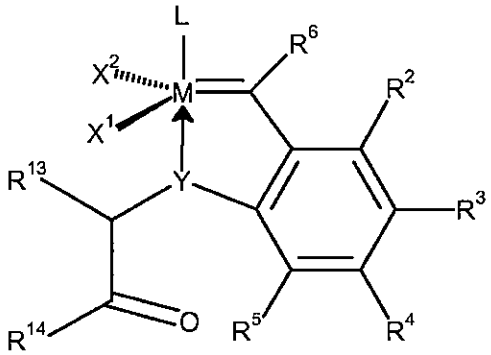
(IIb)

where

R^8, R^9, R^{10}, R^{11}

are identical or different and are each hydrogen, straight-chain or branched, cyclic or acyclic C_1-C_{30}-alkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-carboxylate, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl, C_1-C_{20}-alkylsulphonate, C_6-C_{24}-arylsulphonate or C_1-C_{20}-alkylsulphinyl.

10. A process according to claim 1, wherein the compound of the general formula (I) has the structure the general formula (XVII)



(XVII)

where

M is ruthenium or osmium,

Y is oxygen (O) or an N-R^1 radical,

R^1 is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl, or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,

X^1 and X^2 are identical or different ligands,

R^6 is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical,

R^2, R^3, R^4 and R^5 are identical or different and are each hydrogen, organic or inorganic radicals,

R^{14} is alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals, preferably R^{14} is a C_1-C_{30}-alkyl, C_3-C_{20}-cycloalkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylamino, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl or C_1-C_{20}-alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, alkoxy, aryl or heteroaryl radicals, more preferably

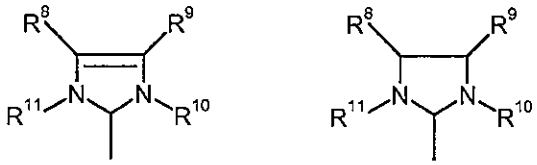
R^{14} is a C_3-C_{20}-cycloalkyl radical, a C_6-C_{24}-aryl radical or a straight-chain or branched C_1-C_{30}-alkyl radical, with the latter optionally being able to be interrupted by one or more double or triple bonds or one or more heteroatoms, preferably oxygen or nitrogen;

R^{13} is hydrogen or alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals, preferably R^{13} is hydrogen or a C_1-C_{30}-alkyl, C_3-C_{20}-cycloalkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylamino, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl or C_1-C_{20}-alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, alkoxy, aryl or heteroaryl radicals, more preferably R^{13} is hydrogen or a C_3-C_{20}-cycloalkyl radical, a C_6-C_{24}-aryl radical or a straight-chain or branched C_1-C_{30}-alkyl radical, with the latter optionally being able to be interrupted by one or more double or triple bonds or one or more heteroatoms, preferably oxygen or nitrogen; and

L is a ligand.

11. A process according to claim 10, wherein in the general formula (XVII)

M	is ruthenium,
X^1 and X^2	are both chlorine,
R^1	is hydrogen,
R^2, R^3, R^4, R^5	are all hydrogen,
R^{13}	is methyl
R^{14}	is methyl and
L	is a substituted or unsubstituted imidazolidine radical of the formula (IIa) or (IIb),



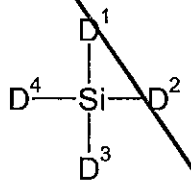
(IIa) (IIb)

where

R^8, R^9, R^{10}, R^{11}

are identical or different and are each hydrogen, straight-chain or branched, cyclic or acyclic C_1-C_{30}-alkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-carboxylate, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl, C_1-C_{20}-alkylsulphonate, C_6-C_{24}-arylsulphonate or C_1-C_{20}-alkylsulphinyl.

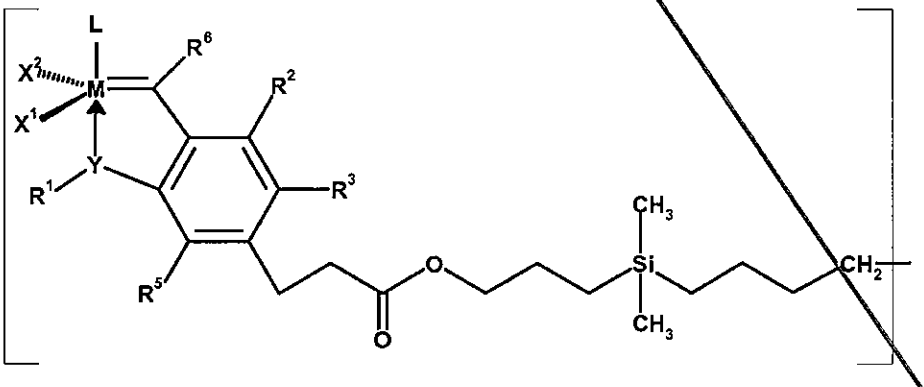
12. A process according to claim 1, wherein the compound of the general formula (I) has the structure the general formula (XIV),



(XIV)

where

D^1, D^2, D^3 and D^4 each have a structure of the general formula (XV) which is bound via the methylene group to the silicon of the formula (XIV),



(XV)

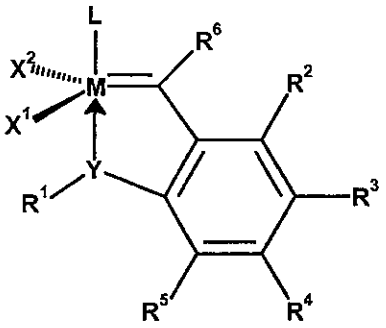
where

M	is ruthenium or osmium,
Y	is oxygen (O), sulphur (S), an N-R^1 radical or a P-R^1 radical, where R^1 is as defined below,
X^1 and X^2	are identical or different ligands,
R^1	is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,
R^2, R^3 and R^5	are identical or different and are each hydrogen, organic or inorganic radicals,
R^6	is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical and
L	is a ligand.

13. A process according to any one of claims 1 to 12, wherein the hydrogenation reaction is carried out in a suitable solvent which does not deactivate the catalyst used and also does not adversely affect the reaction in any other way, preferably selected from the group consisting of dichloromethane, benzene, toluene, methyl ethyl ketone, acetone, tetrahydrofuran, tetrahydropyran, dioxane and cyclohexane, particularly preferably chlorobenzene.

14. The process according to any one of claims 1 to 13, wherein the amount of the compound of the general formula (I) is from 5 to 1000 ppm of noble metal, preferably from 5 to 500 ppm, in particular from 5 to 250 ppm, more preferably from 5 to 100 ppm, based on the nitrile rubber used.

15. Use of a compound of the general formula (I)



(I)

where

M is ruthenium or osmium,

Y is oxygen (O), sulphur (S), an N-R^1 radical or a P-R^1 radical, where R^1 is as defined below,

X^1 and X^2 are identical or different ligands,

R^1 is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl, $CR^{13}C(O)R^{14}$ or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,

R^{13} is hydrogen or alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^{14} is alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^2, R^3, R^4 and R^5 are identical or different and are each hydrogen, organic or inorganic radicals,

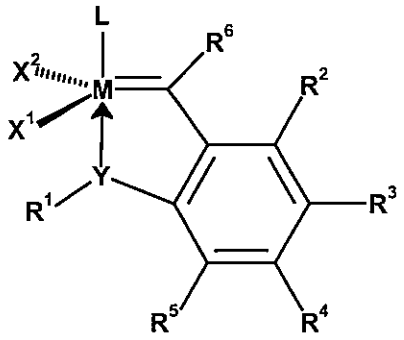
R^6 is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical and

L is a ligand,

in a process for the production of a hydrogenated nitrile rubber by simultaneous hydrogenation and metathesis of a nitrile rubber.

WHAT IS CLAIMED IS:

1. A process for the production of a hydrogenated nitrile rubber comprising reacting a nitrile rubber in the presence of hydrogen, optionally at least one co-olefin, and in the presence of at least one compound of the general formula (I),



(I)

where

M is ruthenium or osmium,

Y is oxygen (O), sulphur (S), an N-R^1 radical or a P-R^1 radical, where R^1 is as defined below,

X^1 and X^2 are identical or different ligands,

R^1 is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl, $CR^{13}C(O)R^{14}$ or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,

R^{13} is hydrogen or alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^{14} is alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^2, R^3, R^4 and R^5 are identical or different and are each hydrogen, organic or inorganic radicals,

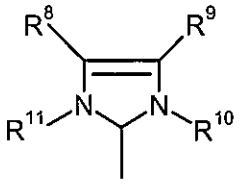
R^6 is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical and

L is a ligand

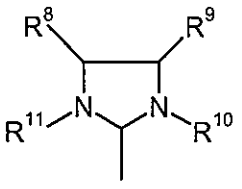
wherein the nitrile rubber is simultaneously subject to a metathesis reaction and a hydrogenation reaction.

2. The process according to claim 1, wherein a catalyst of the general formula (I) is used in which the ligand L is a phosphine, a sulphonated phosphine, phosphate, phosphinite, phosphonite, arsine, stibine, ether, amine, amide, sulphoxide, carboxyl, nitrosyl, pyridine, thioether, or L is a substituted or unsubstituted imidazolidine ("Im") ligand; preferably, L is a C_6-C_{24}-arylphosphine, C_1-C_6-alkylphosphine or C_3-C_{10}-cycloalkylphosphine ligand, a sulphonated C_6-C_{24}-arylphosphine or a sulphonated C_1-C_{10}-alkylphosphine ligand, a C_6-C_{24}-aryl phosphinite or C_1-C_{10}-alkyl phosphinite ligand, a C_6-C_{24}-aryl phosphonite or C_1-C_{10}-alkyl phosphonite ligand, a C_6-C_{24}-aryl phosphite or C_1-C_{10}-alkylphosphite ligand, a C_6-C_{24}-arylarsine or C_1-C_{10}-alkylarsine ligand, a C_6-C_{24}-arylamine or C_1-C_{10}-alkylamine ligand, a pyridine ligand, a C_6-C_{24}-aryl sulphoxide or C_1-C_{10}-alkyl sulphoxide ligand, a C_6-C_{24}-aryl ether or C_1-C_{10}-alkyl ether ligand or a C_6-C_{24}-arylamide or C_1-C_{10}–alkylamide ligand, each of which may be substituted by a phenyl group which may in turn be substituted by a halogen, C_1-C_5 alkyl radical or C_1-C_5-alkoxy radical, or L is a substituted or unsubstituted imidazolidine ("Im") ligand; more preferably, L is selected from the group consisting of PPh_3, $P(p\text{-}Tol)_3$, $P(o\text{-}Tol)_3$, $PPh(CH_3)_2$, $P(CF_3)_3$, $P(p\text{-}FC_6H_4)_3$, $P(p\text{-}CF_3C_6H_4)_3$, $P(C_6H_4\text{-}SO_3Na)_3$, $P(CH_2C_6H_4\text{-}SO_3Na)_3$, $P(iso\text{-}Pr)_3$, $P(CHCH_3(CH_2CH_3))_3$, $P(cyclopentyl)_3$, $P(cyclohexyl)_3$, $P(neopentyl)_3$ and $P(neophenyl)_3$, or L is a substituted or unsubstituted imidazolidine ("Im") ligand.

3. The process according to claim 2, wherein the imidazolidine radical **(Im)** has a structure of the general formula (IIa) or (IIb),



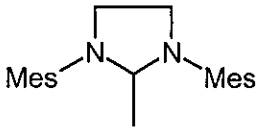
(IIa)



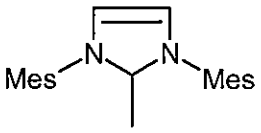
(IIb)

where

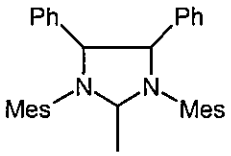
R^8, R^9, R^{10}, R^{11} are identical or different and are each hydrogen, straight-chain or branched C_1-C_{30}-alkyl, preferably C_1-C_{20}-alkyl, C_3-C_{20}-cycloalkyl, preferably C_3-C_{10}-cycloalkyl, C_2-C_{20}-alkenyl, preferably C_2-C_{10}-alkenyl, C_2-C_{20}-alkynyl, preferably C_2-C_{10}-alkynyl, C_6-C_{24}-aryl, preferably C_6-C_{14}-aryl, C_1-C_{20}-carboxylate, preferably C_1-C_{10}-carboxylate, C_1-C_{20}-alkoxy, preferably C_1-C_{10}-alkoxy, C_2-C_{20}-alkenyloxy, preferably C_2-C_{10}-alkenyloxy, C_2-C_{20}-alkynyloxy, preferably C_2-C_{10}-alkynyloxy, C_6-C_{24}-aryloxy, preferably C_6-C_{14}-aryloxy, C_2-C_{20}-alkoxycarbonyl, preferably C_2-C_{10}-alkoxycarbonyl, C_1-C_{20}-alkylthio, preferably C_1-C_{10}-alkylthio, C_6-C_{24}-arylthio, preferably C_6-C_{14}-arylthio, C_1-C_{20}-alkylsulphonyl, preferably C_1-C_{10}-alkylsulphonyl, C_1-C_{20}-alkylsulphonate, preferably C_1-C_{10}-alkylsulphonate, C_6-C_{24}-arylsulphonate, preferably C_6-C_{14}-arylsulphonate, or C_1-C_{20}-alkylsulphinyl, preferably C_1-C_{10}-alkylsulphinyl; preferably, the imidazolidine radical (Im) has a structure of the formulae (IIIa-f), where Mes is in each case a 2,4,6-trimethylphenyl radical



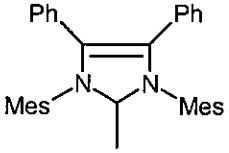
(IIIa)



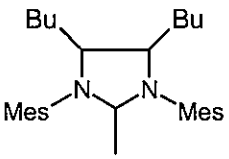
(IIIb)



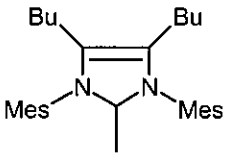
(IIIc)



(IIId)



(IIIe)

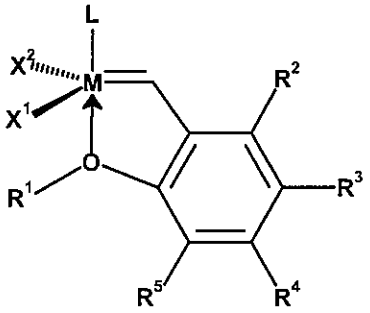


(IIIf)

4. The process according to any one of claims 1 to 3, wherein X^1 and X^2 in the catalyst of the general formulae (I) are identical or different and represent hydrogen, halogen, pseudohalogen, straight-chain or branched C_1-C_{30}-alkyl, C_6-C_{24}-aryl, C_1-C_{20}-alkoxy, C_6-C_{24}-aryloxy, C_3-C_{20}-alkyldiketonate, C_6-C_{24}-aryldiketonate, C_1-C_{20}-carboxylate, C_1-C_{20}-alkylsulphonate, C_6-C_{24}-arylsulphonate, C_1-C_{20}-alkylthiol, C_6-C_{24}-arylthiol, C_1-C_{20}-alkylsulphonyl or C_1-C_{20}-alkylsulphinyl; preferably, X^1 and X^2 are identical or different

and are each halogen, in particular fluorine, chlorine, bromine or iodine, benzoate, C_1-C_5-carboxylate, C_1-C_5-alkyl, phenoxy, C_1-C_5-alkoxy, C_1-C_5-alkylthiol, C_6-C_{24}-arylthiol, C_6-C_{24}-aryl or C_1-C_5-alkylsulphonate; more preferably, X^1 and X^2 are each halogen, in particular chlorine, CF_3COO, CH_3COO, CFH_2COO, $(CH_3)_3CO$, $(CF_3)_2(CH_3)CO$, $(CF_3)(CH_3)_2CO$, PhO, MeO, EtO, tosylate, mesylate or CF_3SO_3.

5. The process according to any one of claims 1 to 4, wherein the compound of the general formulae (I) has the following structure (IV)



(IV)

wherein

M is ruthenium,

X^1 and X^2 are both halogen, in particular, both chlorine,

R^1 is a straight-chain or branched C_1-C_{12}-alkyl radical,

R^2, R^3, R^4, R^5 are identical or different and are each hydrogen, organic or inorganic radicals, and

L is a ligand.

6. The process according to claim 5, wherein in the compound of formula (IV)

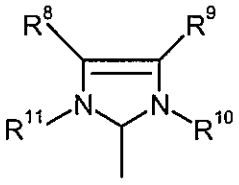
M is ruthenium,

X^1 and X^2 are both chlorine,

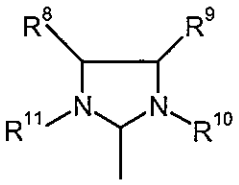
R^1 is an isopropyl radical,

R^2, R^3, R^4, R^5 are all hydrogen and

L is a substituted or unsubstituted imidazolidine radical of the formula (IIa) or (IIb),



(IIa)



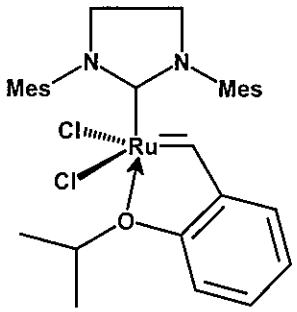
(IIb)

where

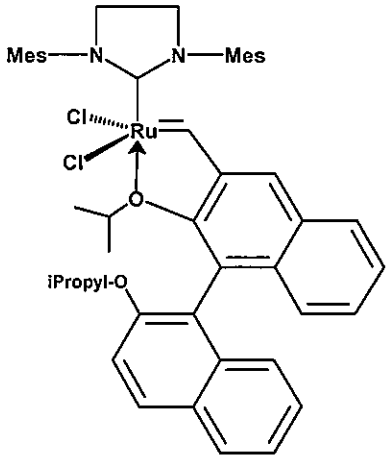
R^8, R^9, R^{10}, R^{11}

are identical or different and are each hydrogen, straight-chain or branched C_1-C_{30}-alkyl, C_3-C_{20}-cycloalkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-carboxylate, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl, C_1-C_{20}-alkylsulphonate, C_6-C_{24}-arylsulphonate or C_1-C_{20}-alkylsulphinyl.

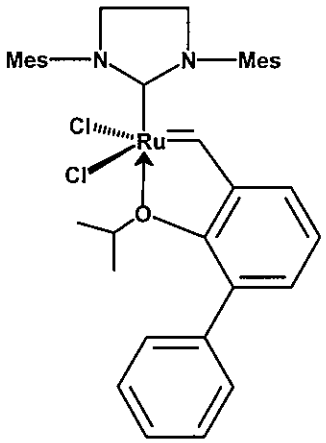
7. The process according to claim 5 or 6, wherein the compound of the formula (IV) is selected from the structures of formulae (V), (VI), (VII), (VIII), (IX), (X), (XI), (XII) and (XIII), where Mes is in each case a 2,4,6-trimethylphenyl radical



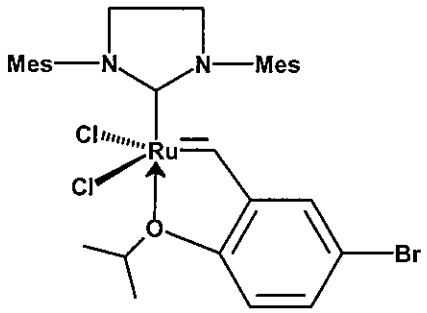
(V)



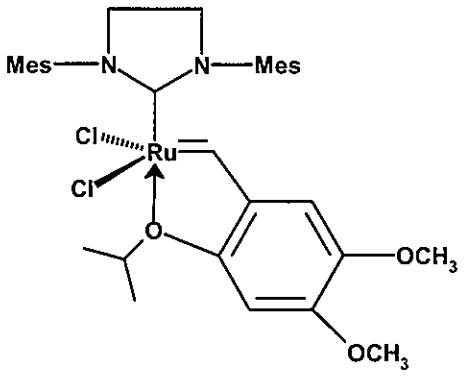
(VI)



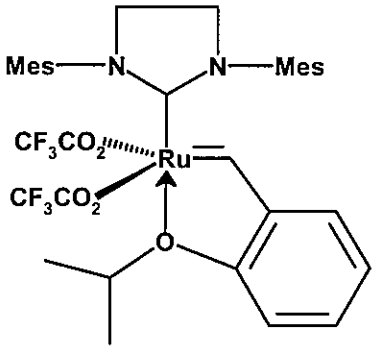
(VII)



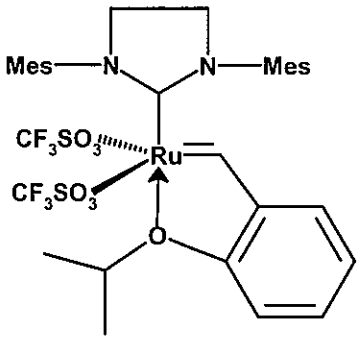
(VIII)



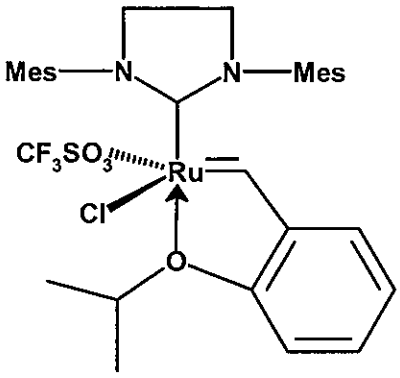
(IX)



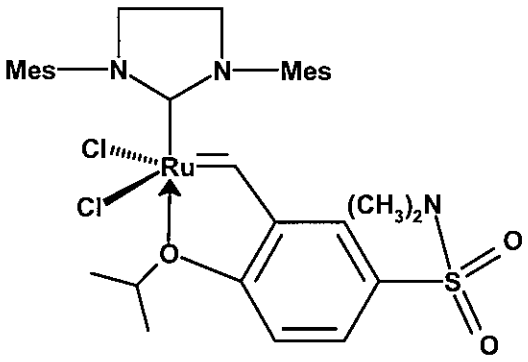
(X)



(XI)

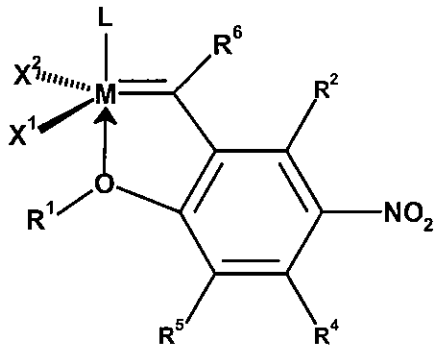


(XII)



(XIII)

8. A process according to claim 1 wherein the compound of the general formula (I) has the structure of the general formula (XIV)



(XIV)

where

M is ruthenium or osmium,

X^1 and X^2 are identical or different ligands,

R^1 is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl, $CR^{13}C(O)R^{14}$ or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,

R^{13} is hydrogen or alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^{14} is alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^2, R^4 and R^5 are identical or different and are each hydrogen, organic or inorganic radicals,

R^6 is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical, and

L is a ligand.

9. A process according to claim 8, wherein in the compounds of the general formula (XIV)

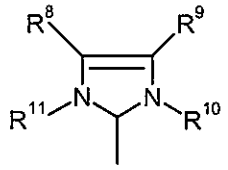
M is ruthenium,

X^1 and X^2 are both chlorine,

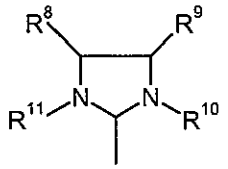
R^1 is an isopropyl radical,

R^2, R^4 and R^5 are each hydrogen and

L is a substituted or unsubstituted imidazolidine radical of the formula (IIa) or (IIb),



(IIa)



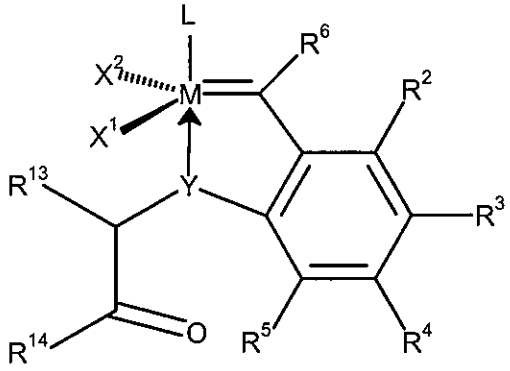
(IIb)

where

R^8, R^9, R^{10}, R^{11}

are identical or different and are each hydrogen, straight-chain or branched, cyclic or acyclic C_1-C_{30}-alkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-carboxylate, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl, C_1-C_{20}-alkylsulphonate, C_6-C_{24}-arylsulphonate or C_1-C_{20}-alkylsulphinyl.

10. A process according to claim 1, wherein the compound of the general formula (I) has the structure the general formula (XVII)



(XVII)

where

M is ruthenium or osmium,

Y is oxygen (O) or an N-R^1 radical,

R^1 is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl, or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,

X^1 and X^2 are identical or different ligands,

R^6 is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical,

R^2, R^3, R^4 and R^5 are identical or different and are each hydrogen, organic or inorganic radicals,

R^{14} is alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals, preferably R^{14} is a C_1-C_{30}-alkyl, C_3-C_{20}-cycloalkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylamino, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl or C_1-C_{20}-alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, alkoxy, aryl or heteroaryl radicals, more preferably R^{14} is a C_3-C_{20}-cycloalkyl radical, a C_6-C_{24}-aryl radical or a straight-chain or branched C_1-C_{30}-alkyl radical, with the latter optionally being able to be interrupted by one or more double or triple bonds or one or more heteroatoms, preferably oxygen or nitrogen;

R^{13} is hydrogen or alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals, preferably R^{13} is hydrogen or a C_1-C_{30}-alkyl, C_3-C_{20}-cycloalkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylamino, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl or C_1-C_{20}-alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, alkoxy, aryl or heteroaryl radicals, more preferably R^{13} is hydrogen or a C_3-C_{20}-

cycloalkyl radical, a C_6-C_{24}-aryl radical or a straight-chain or branched C_1-C_{30}-alkyl radical, with the latter optionally being able to be interrupted by one or more double or triple bonds or one or more heteroatoms, preferably oxygen or nitrogen; and

L is a ligand.

11. A process according to claim 10, wherein in the general formula (XVII)

M is ruthenium,

X^1 and X^2 are both chlorine,

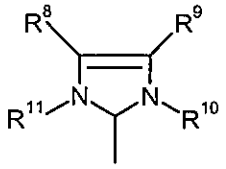
R^1 is hydrogen,

R^2, R^3, R^4, R^5 are all hydrogen,

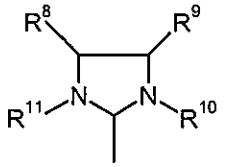
R^{13} is methyl

R^{14} is methyl and

L is a substituted or unsubstituted imidazolidine radical of the formula (IIa) or (IIb),



(IIa)



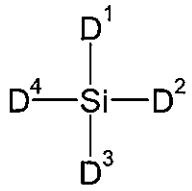
(IIb)

where

R^8, R^9, R^{10}, R^{11}

are identical or different and are each hydrogen, straight-chain or branched, cyclic or acyclic C_1-C_{30}-alkyl, C_2-C_{20}-alkenyl, C_2-C_{20}-alkynyl, C_6-C_{24}-aryl, C_1-C_{20}-carboxylate, C_1-C_{20}-alkoxy, C_2-C_{20}-alkenyloxy, C_2-C_{20}-alkynyloxy, C_6-C_{24}-aryloxy, C_2-C_{20}-alkoxycarbonyl, C_1-C_{20}-alkylthio, C_6-C_{24}-arylthio, C_1-C_{20}-alkylsulphonyl, C_1-C_{20}-alkylsulphonate, C_6-C_{24}-arylsulphonate or C_1-C_{20}-alkylsulphinyl.

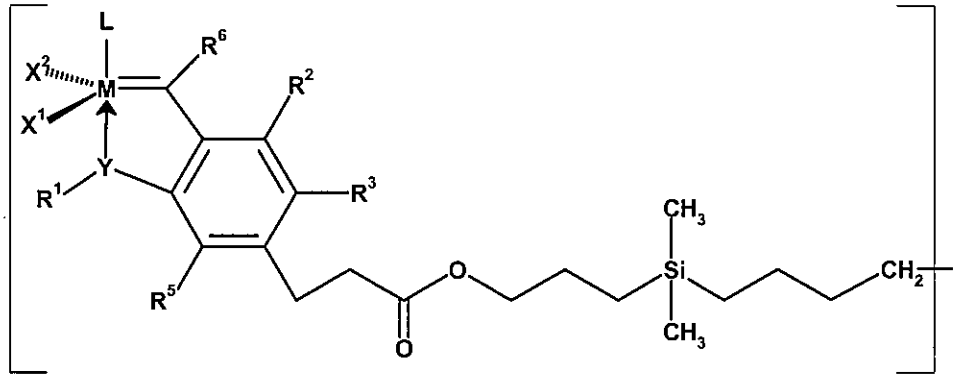
12. A process according to claim 1, wherein the compound of the general formula (I) has the structure the general formula (XIV),



(XIV)

where

D^1, D^2, D^3 and D^4 each have a structure of the general formula (XV) which is bound via the methylene group to the silicon of the formula (XIV),



(XV)

where

M is ruthenium or osmium,

Y is oxygen (O), sulphur (S), an N-R^1 radical or a P-R^1 radical, where R^1 is as defined below,

X^1 and X^2 are identical or different ligands,

R^1 is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,

R^2, R^3 and R^5 are identical or different and are each hydrogen, organic or inorganic radicals,

R^6 is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical and

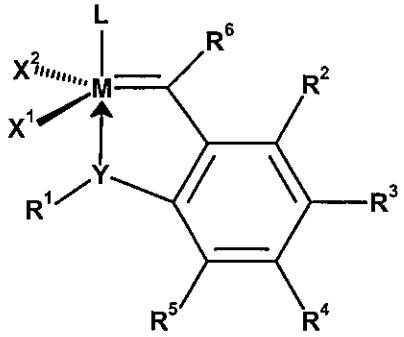
L is a ligand.

13. A process according to any one of claims 1 to 12, wherein the hydrogenation reaction is carried out in a suitable solvent which does not deactivate the catalyst used and also does

not adversely affect the reaction in any other way, preferably selected from the group consisting of dichloromethane, benzene, toluene, methyl ethyl ketone, acetone, tetrahydrofuran, tetrahydropyran, dioxane and cyclohexane, particularly preferably chlorobenzene.

14. The process according to any one of claims 1 to 13, wherein the amount of the compound of the general formula (I) is from 5 to 1000 ppm of noble metal, preferably from 5 to 500 ppm, in particular from 5 to 250 ppm, more preferably from 5 to 100 ppm, based on the nitrile rubber used.

15. Use of a compound of the general formula (I)



(I)

where

M is ruthenium or osmium,

Y is oxygen (O), sulphur (S), an N-R^1 radical or a P-R^1 radical, where R^1 is as defined below,

X^1 and X^2 are identical or different ligands,

R^1 is an alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl, $CR^{13}C(O)R^{14}$ or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals,

R^{13} is hydrogen or alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^{14} is alkyl, cycloalkyl, alkenyl, alkynyl, aryl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylamino, alkylthio, arylthio, alkylsulphonyl or alkylsulphinyl radical, each of which may optionally be substituted by one or more alkyl, halogen, alkoxy, aryl or heteroaryl radicals;

R^2, R^3, R^4 and R^5 are identical or different and are each hydrogen, organic or inorganic radicals,

R^6 is hydrogen or an alkyl, alkenyl, alkynyl or aryl radical and

L is a ligand,

in a process for the production of a hydrogenated nitrile rubber by simultaneous hydrogenation and metathesis of a nitrile rubber.