CLAIMS

1. A catalyst comprising ~~coke:~~

(a) from 2% by weight to 30% by weight, preferably from 6% by weight to 20% by weight, with respect to the total weight of said catalyst, of coke;

(b) from 70% by weight to 98% by weight, preferably from 80% by weight to 94% by weight, with respect to the total weight of said catalyst, of at least one compound selected from: aluminum oxide (γ-Al_2O_3), aluminum silicate, silicas-aluminas (SiO_2-Al_2O_3), aluminas, zeolites, metal oxides (such as lanthanum oxide, zirconium oxide, tungsten oxide, thallium oxide, magnesium oxide, zinc oxide, silver oxide); preferably selected from silicas-aluminas (SiO_2-Al_2O_3);

the sum of (a) + (b) being equal to 100;

characterised in that said coke, upon analysis by infrared spectroscopy in diffuse reflection ("Diffuse Reflectance Infrared Fourier Transform Spectroscopy" - DRIFTS), has at least two peaks at a wavelength comprised between 1450 cm^{-1} and 1700 cm^{-1}.

2. The catalyst comprising coke according to claim 1, wherein said catalyst comprises at least one compound selected from: aluminum oxide (γ-Al_2O_3), aluminum silicate, silicas-aluminas (SiO_2-Al_2O_3), aluminas, zeolites, metal oxides (such as lanthanum oxide, zirconium oxide, tungsten oxide, thallium oxide, magnesium oxide, zinc oxide, silver oxide); preferably selected from silicas-aluminas (SiO_2-Al_2O_3).

~~3. The catalyst comprising coke according to claim 1 or 2, wherein said catalyst comprises:~~

~~(a) from 2% by weight to 30% by weight, preferably from 6% by weight to 20% by weight, with respect to the total weight of said catalyst, of coke;~~

~~(b) from 70% by weight to 98% by weight, preferably from 80% by weight to 94% by weight, with respect to the total weight of said catalyst, of at least one compound selected from: aluminum oxide (γ-~~

~~Al_2O_3), aluminum silicate, silicas-aluminas (SiO_2-Al_2O_3), aluminas, zeolites, metal oxides (such as lanthanum oxide, zirconium oxide, tungsten oxide, thallium oxide, magnesium oxide, zinc oxide, silver oxide); preferably selected from silicas-aluminas (SiO_2-Al_2O_3);~~

~~the sum of (a) + (b) being equal to 100.~~

~~4~~ ***3***. A process for the production of a diene, preferably a conjugated diene, more preferably 1,3-butadiene, comprising the dehydration of at least one alkenol having a number of carbon atoms equal to or greater than 4, in the presence of at least one catalyst comprising coke~~, characterised in that said coke, upon analysis by infrared spectroscopy in diffuse reflection ("Diffuse Reflectance Infrared Fourier Transform Spectroscopy" - DRIFT), has at least two peaks at a wavelength comprised between 1450 cm^{-1} and 1700 cm^{-1}~~ ***according to claim 1***.

~~5~~ ***4***. The process for the production of a diene, according to claim ~~4~~ ***3***, wherein said ~~linear or branched~~ alkenol has the general formula $C_nH_{2n}O$, n being an integer greater than or equal to 4 and less than or equal to 8, preferably greater than or equal to 4 and less than or equal to 6, even more preferably equal to 4.

~~6~~ ***5***. The process for the production of a diene, according to claim ~~4 or 5~~ ***3 or 4***, wherein said alkenol has a number of carbon atoms equal to 4 and is therefore a butenol; preferably said alkenol is selected from 2-buten-1-ol (crotyl alcohol) (2-Bu-1-OH), 3-buten-2-ol (methyl-vinyl-carbinol) (3-Bu-2-OH), 3-buten-1-ol (allylcarbinol) (3-Bu-1-OH), or mixtures thereof; even more preferably, said alkenol is selected from 2-buten-1-ol (2-Bu-1-OH), 3-buten-2-ol (3-Bu-2-OH), or mixtures thereof.

~~7~~ ***6***. The process for the production of a diene, according to any one of the claims ~~4 to 6~~ ***3 to 5***, wherein said alkenol having a number of carbon atoms equal to or greater than 4, is obtained directly from biosynthetic processes, or through catalytic dehydration processes of at least one diol.

~~8~~ ***7***. The process for the production of a diene, according to any one of claims ~~4 to 7~~ ***3 to 6***, wherein when said alkenol has a number of carbon atoms equal to 4, and is therefore a butenol, said butenol is obtained by catalytic

dehydration of a butanediol, preferably 1,3-butanediol, in the presence of a cerium oxide catalyst, wherein said cerium oxide catalyst is obtained by precipitation, in the presence of at least one base, of at least one cerium-containing compound.

~~9~~ ***8***. The process for the production of a diene, according to claim ~~7 or 8~~ ***6 or 7***, wherein said diol, preferably a butanediol, more preferably 1,3-butanediol, derives from the fermentation of sugars, preferably from the fermentation of sugars deriving from biomass; preferably, said diol derives from the fermentation of sugars deriving from guayule and/or thistle biomass, including scraps, residues, wastes deriving from guayule and/or thistle, or from their processing; more preferably, said diol derives from the fermentation of sugars deriving from guayule biomass, including scraps, residues, waste deriving from guayule, or from its processing.

~~10~~ ***9***. The process for the production of a diene, according to any one of the claims ~~4 to 9~~ ***3 to 8***, wherein said alkenol having a number of carbon atoms equal to or greater than 4 is mixed with a diluent that is selected from: an inert gas, such as nitrogen (N_2), argon (Ar), preferably N_2; or it is mixed with a compound having a boiling temperature comprised between 25°C and 150°C under normal conditions and preferably, a boiling temperature comprised between 50°C and 125°C under normal conditions, and a melting temperature less than or equal to 20°C under normal conditions, selected from water, tetrahydrofuran, cyclohexane, benzene, or mixtures thereof; preferably said diluent is selected from nitrogen (N_2) and water; even more preferably, it is water.

~~11~~ ***10***. The process for the production of a diene, according to claim ~~10~~ ***9***, wherein:

- in case the diluent is selected from inert gases, said process is carried out with a molar ratio of diluent to alkenol (or alkenols) greater than 0.3, preferably comprised between 0.5 and 2;
- in case the diluent is selected from compounds having a boiling temperature comprised between 25°C and 150°C under normal conditions, preferably comprised between 50°C and 125°C under

normal conditions and a melting temperature less than or equal to 20°C under normal conditions, said process is carried out with a molar ratio of diluent to alkenol (or alkenols) comprised between 0.01 and 100, preferably comprised between 0.1 and 50, more preferably comprised between 1 and 10.

~~12~~ ***11***. The process for the production of a diene, according to any one of claims ~~4 to 11~~ ***3 to 10***, wherein said process is carried out:

- at a temperature ~~comprised between 250°C and 500°C, preferably~~ comprised between 280°C and 450°C; and/or
- at a pressure comprised between 5 kPa and 5000 kPa, preferably comprised between 30 kPa and 350 kPa, more preferably comprised between 80 kPa and 250 kPa; and/or
- in the gas phase or mixed liquid/gas phase; and~~/or~~
- ~~in a fixed-bed reactor, in a moving-bed reactor, or in a fluidised-bed reactor; and~~
- if it is carried out in a mixed liquid/gas phase, using a continuous stirring reactor ("Continuous flow Stirred-Tank Reactor", CSTR) containing the catalyst comprising coke in dispersion; and/or
- continuously or in batches, and preferably continuously; and~~/or~~
- if carried out continuously, the space velocity WHSV (“Weight Hourly Space Velocity”), that is, the ratio of the amount by weight of reactant fed to the reactor to the quantity of catalyst weight in the reactor, is comprised between 0.5 h^{-1} and 10 h^{-1}, preferably comprised between 1 h^{-1} and 5 h^{-1}; and/or the contact time (τ), calculated as the ratio of the volume of catalyst comprising coke loaded into the dehydration reactor over the volumetric supply flow rate in the reaction conditions, is preferably comprised between 0.01 seconds and 10 seconds, more preferably comprised between 0.05 seconds and 8 seconds, even more preferably comprised between 0.1 seconds and 4 seconds.

12. The process for the production of a diene, according to any one of claims 3 to 10, wherein said process is carried out:

- ***at a temperature comprised between 280°C and 450°C; and/or***
- ***at a pressure comprised between 5 kPa and 5000 kPa, preferably comprised between 30 kPa and 350 kPa, more preferably comprised between 80 kPa and 250 kPa; and/or***
- ***in a fixed-bed reactor, in a moving-bed reactor, or in a fluidised-bed reactor; and***
- ***continuously or in batches, and preferably continuously; and***
- ***if carried out continuously, the space velocity WHSV ("Weight Hourly Space Velocity"), that is, the ratio of the amount by weight of reactant fed to the reactor to the quantity of catalyst weight in the reactor, is comprised between 0.5 h^{-1} and 10 h^{-1}, preferably comprised between 1 h^{-1} and 5 h^{-1}; and/or the contact time (τ), calculated as the ratio of the volume of catalyst comprising coke loaded into the dehydration reactor over the volumetric supply flow rate in the reaction conditions, is preferably comprised between 0.01 seconds and 10 seconds, more preferably comprised between 0.05 seconds and 8 seconds, even more preferably comprised between 0.1 seconds and 4 seconds.***

13. A process for the production of a catalyst comprising coke~~, characterised in that said coke, upon analysis by infrared spectroscopy in diffuse reflection ("Diffuse Reflectance Infrared Fourier Transform Spectroscopy" - DRIFTS) has at least two peaks at a wavelength comprised between 1450 cm^{-1} and 1700 cm^{-1}~~ ***according to claim 1***, said process comprising the dehydration of a mixture of alkenols comprising 3-buten-2-ol (3-Bu-2-OH) and 2-buten-1-ol (2-Bu-1-OH), in the presence of at least one compound selected from: aluminium oxide (γ-Al_2O_3), aluminum silicate, silicas-aluminas (SiO_2-Al_2O_3), aluminas, zeolites, metal oxides (such as lanthanum oxide, zirconium oxide, tungsten oxide, thallium oxide, magnesium oxide, zinc oxide, silver oxide), preferably selected from silicas-aluminas (SiO_2-Al_2O_3), said process being carried out at a temperature comprised between 250°C and 500°C, preferably comprised between 280°C and 450°C, for a time comprised between 2 hours and 10 hours, preferably comprised between 2.5

hours and 9 hours.