1) provision of at least one support material, an oxidic tungsten compound and at least one separate alkali metal compound,
2) mixing of the support material with the oxidic tungsten compound and the at least one separate alkali metal compound in order to obtain a catalyst composition and
3) shaping of the catalyst composition obtained,

and also the catalysts produced by this process.

In a first aspect, there is provided a process for producing a catalyst comprising a support material and an oxidic composition containing oxygen together with at least one alkali metal and tungsten, said process comprising the steps:

1) provision of at least one support material, an oxidic tungsten compound and at least one separate alkali metal compound,
2) mixing of the support material with the oxidic tungsten compound and the at least one separate alkali metal compound in order to obtain a catalyst composition, wherein the oxidic tungsten compound and the separate alkali metal compound are added in succession to the support material, and
3) shaping of the catalyst composition obtained.

In a second aspect, there is provided a catalyst which comprises a support material and an oxidic composition containing oxygen together with at least one alkali metal and tungsten and is produced from particles of the support material having a particle size of less than 1000 µm, characterized in that the catalyst composition is homogeneously distributed throughout the entire shaped catalyst body, in which the standard deviation stadev of the normalized tungsten concentration (cnorm (W)) over the cross section of the catalyst is less than 20, determined by quantitative EDX analysis in accordance with ISO 22309 (2006) in square measurement spots, preferably at least 10 square measurement spots, which have a side length of 100 µm in each case and whose midpoints lie on a straight line and are in each case 100 µm from the midpoint of the adjoining square, with the first and last midpoint of a square being in each case 100 µm from the edge of the catalyst cross section.

In a third aspect, there is provided a catalyst as defined above, produced by a process as defined above.

In a fourth aspect, there is provided a process for preparing alkyl mercaptans by reaction of alkanols with hydrogen sulphide in the presence of a catalyst as defined above or in the presence of a catalyst produced by a process as defined above.

In the processes known from the prior art which involve an alkali metal tungstate and a support material such as aluminium oxide, a solution of the alkali metal tungstate is always produced first and is then added to the support material. This solution is then usually applied to particles of the support material having a size of a number of millimetres in an impregnation process, preferably a multistage impregnation process.

It has now surprisingly been found that an increased activity and selectivity of the catalyst can be obtained when the support material is not impregnated with a solution containing both the alkali metal and the tungstate, but instead the support material is mixed with an oxidic tungsten compound which preferably does not contain any alkali metal and with a separate alkali metal compound.

The catalysts produced by the process of the invention make it possible to achieve a higher conversion and a greater selectivity under identical reaction conditions and the same loading compared to catalysts known from the prior art which have been produced by the impregnation process.

Furthermore, the process of the invention allows simple variation of the ratio of the content of alkali metal to the content of tungsten in the oxidic composition, expressed as ratio of alkali metal oxide A_2O in % by weight, based on the total mass of the catalyst, to tungsten(VI) oxide WO_3 in % by weight, based on the total mass of the catalyst. The total loading of the catalyst with the oxidic composition containing the alkali metal and tungsten is the sum of the abovementioned proportions of A_2O and WO_3 in the catalyst. The advantages of

Claims

1. Process for producing a catalyst comprising a support material and an oxidic composition containing oxygen together with at least one alkali metal and tungsten, said process comprising the steps:
   1) provision of at least one support material, an oxidic tungsten compound and at least one separate alkali metal compound,
   2) mixing of the support material with the oxidic tungsten compound and the at least one separate alkali metal compound in order to obtain a catalyst composition, wherein the oxidic tungsten compound and the separate alkali metal compound are added in succession to the support material, and
   3) shaping of the catalyst composition obtained.

2. Process according to claim 1, wherein the support is either first mixed with the oxidic tungsten compound and the resulting mixture is then mixed with the at least one alkali metal compound, or the support material is first mixed with the at least one alkali metal compound and the resulting mixture is subsequently mixed with the oxidic tungsten compound to form a catalyst composition.

3. Process according to Claim 1 or 2, wherein the oxidic tungsten compound is selected from the group consisting of tungsten trioxide (WO_3), tungstic acid ($WO_3 \cdot H_2O$), metatungstic acid, paratungstic acid, isopolytungstic acids, heteropolytungstic acids, ammonium salts thereof, hydrates thereof and mixtures thereof and is preferably tungstic acid, ammonium orthotungstate, ammonium metatungstate or ammonium paratungstate.

4. Process according to any of Claims 1 ~~or 2~~to 3, wherein the at least one alkali metal compound is a basic alkali metal compound, preferably selected from the group consisting of hydroxides and carbonates of alkali metals, particularly preferably from the group consisting of hydroxides and carbonates of sodium, potassium, caesium and rubidium.

5. Process according to any of Claims 1 to 4, wherein the support material is an oxidic inorganic support material, preferably selected from the group consisting of aluminium oxide, silicon dioxide, titanium dioxide, zirconium oxide, amorphous aluminosilicates and mixtures thereof, and is preferably used in the form of particles having a size of less than 1000 µm.

6. Process according to any of Claims 1 to 5, wherein the oxidic tungsten compound and the separate alkali metal compound are added in succession to the support material and the oxidic tungsten compound is

preferably added as a solid to the support material or to the mixture of support material and the at least one alkali metal compound.

67. Process according to any of Claims 1 to 56, wherein at least one organic and/or inorganic binder is added in one or both of Steps 2 and 3.

78. Process according to any of Claims 1 to 67, wherein the shaping of the catalyst is carried out by extrusion or pressing and the process preferably comprises the following additional steps:

(i) drying of the catalyst composition and/or of the shaped catalyst, and
(ii) calcination of the catalyst composition and/or of the shaped catalyst.

89. Catalyst which comprises a support material and an oxidic composition containing oxygen together with at least one alkali metal and tungsten and is produced from particles of the support material having a particle size of less than 1000 µm, characterized in that the catalyst composition is homogeneously distributed throughout the entire shaped catalyst body~~.~~, in which the standard deviation stadev of the normalized tungsten concentration (c_{norm} (W)) over the cross section of the catalyst is less than 20, determined by quantitative EDX analysis in accordance with ISO 22309 (2006) in square measurement spots, preferably at least 10 square measurement spots, which have a side length of 100 µm in each case and whose midpoints lie on a straight line and are in each case 100 µm from the midpoint of the adjoining square, with the first and last midpoint of a square being in each case 100 µm from the edge of the catalyst cross section.

~~9. Catalyst according to Claim 8 in which the standard deviation stadev of the normalized tungsten concentration (cnorm (W)) over the cross section of the catalyst is less than 20, determined by quantitative EDX analysis in accordance with ISO 22309 (2006) in square measurement spots, preferably at least 10 square measurement spots, which have a side length of 100 µm in each case and whose midpoints lie on a straight line and are in each case 100 µm from the midpoint of the adjoining square, with the first and last midpoint of a square being in each case 100 µm from the edge of the catalyst cross section.~~

10. Catalyst according to Claim ~~8 or~~ 9, characterized in that the oxidic composition is a composition of the general formula A_xWO_y, where the symbols have the following meanings
A: at least one alkali metal, preferably selected from the group consisting of sodium, potassium, rubidium and caesium,
x: mole fraction of the at least one alkali metal relative to tungsten in the composition, which is preferably in the range from 2:1 to 0.8:1, and

y: mole fraction of oxygen in the composition, which is preferably in the range from 3.4 to 4.

11. Catalyst according to ~~any of~~ Claim~~s~~ ~~8 to~~9 or 10 produced by a process which comprises a step of mixing ~~a solid tungsten compound, preferably~~ a solid oxidic tungsten compound, with the support material.

12. Catalyst according to any of Claims ~~8~~ 9 to 11, wherein the proportion of the oxidic composition composed of alkali metal and tungsten in the catalyst is greater than 15% by weight, preferably greater than 25% by weight, more preferably greater than 36% by weight, particularly preferably greater than 40% by weight and in particular greater than 45% by weight, based on the total weight of the catalyst.

13. Catalyst according to any of Claims ~~8~~ 9 to 12 which further comprises at least one organic and/or inorganic binder.

14. Catalyst according to any of Claims ~~8~~ 9 to 13 produced by a process according to any of Claims 1 to ~~7~~8.

15. Process for preparing alkyl mercaptans by reaction of alkanols with hydrogen sulphide in the presence of a catalyst according to any of Claims ~~8~~ 9 to 14 or in the presence of a catalyst produced by a process according to any of Claims 1 to ~~7~~8.