Claims

1. A method for producing a sulphided copper sorbent, comprising the steps of: (i) contacting a sorbent precursor material containing one or more sulphidable copper compounds, with a sulphiding gas stream comprising hydrogen sulphide and an inert gas selected from nitrogen, argon, helium, carbon dioxide, methane, and mixtures thereof to form a sulphided sulphur-containing sorbent material, and (ii) subjecting the sulphided sulphur-containing sorbent material to a heating step in which it is heated to a temperature above that used in the sulphiding step and ≥ 110 °C, under an inert gas selected from nitrogen, argon, helium, carbon dioxide, methane, and mixtures thereof, or an inert gas selected from nitrogen, argon, helium, carbon dioxide, methane, and mixtures thereof, further comprising hydrogen sulphide~~said inert gas optionally comprising hydrogen sulphide~~.

2. A method according to claim 1 wherein the precursor is formed by combining an oxide, hydroxide, carbonate or hydroxycarbonate of copper or copper and zinc, with one or more binders and optionally a support material.

3. A method according to claim 1 wherein the sorbent precursor is formed by impregnating a support material with a solution of a soluble salt of copper, followed by drying and optionally calcining the impregnated support.

4. A method according to claim 1 wherein the sorbent precursor is formed by coating a support material with a slurry of an insoluble copper compound, followed by drying and optionally calcining the coated support.

5. A method according to any one of claims 2 to 4 wherein the support material is selected from the group consisting of alumina, hydrated alumina, metal-aluminate, silica, titania, zirconia, zinc oxide, aluminosilicates, zeolites, or a mixture thereof.

~~6. A method according to any one of claims 1 to 5 wherein the sulphiding gas stream comprises hydrogen sulphide and an inert gas selected from nitrogen, argon, helium, carbon dioxide, methane, and mixtures thereof.~~

~~7.~~6. A method according to any one of claims 1 to ~~6~~ 5 wherein the hydrogen sulphide content of the sulphiding gas stream is 0.25 to 80% by volume, preferably 0.5 to10% by volume, more preferably 0.75 to 4.5% by volume.

~~8.~~7. A method according to any one of claims 1 to ~~7~~ 6 where the pressure of the sulphiding gas stream is in the range $6.9x10^3$ to $6.9x10^5$ Pag, preferably $6.9x10^3$ to $13.8x10^4$ Pag (1 to 100 psig, preferably 1 to 20 psig).

~~9.~~8. A method according to any one of claims 1 to ~~8~~ 7 wherein the total oxidant content of the sulphiding gas stream, wherein the oxidant is selected from one or more of free oxygen (O_2), sulphur oxides and nitrogen oxides, is ≤ 1%, preferably ≤ 0.1%, more preferably ≤ 0.01% and most preferably ≤ 0.001% by volume.

~~10.~~9. A method according to any one of claims 1 to ~~9~~ 8 wherein the inlet temperature for the sulphiding step is in the range 0-150 °C, preferably 20-100 °C.

~~11.~~10. A method according to any one of claims 1 to ~~10~~ 9 wherein the sulphiding gas stream is passed through a fixed bed of the sorbent precursor at a linear velocity ≥ 0.1m/s but less than the fluidisation velocity.

~~12.~~11. A method according to any one of claims 1 to ~~11~~ 10 wherein the sulphiding gas stream comprises water vapour.

~~13.~~12. A method according to any one of claims 1 to ~~12~~ 11 wherein the sulphiding gas stream has a water vapour level in the range 0.2 to 2.0 % by volume.

~~14.~~13. A method according to any one of claims 1 to ~~13~~ 12 wherein the sulphur-containing sorbent material is heated to a temperature in the heating step that is 40 or more degrees centigrade higher than the maximum temperature in the sulphiding step.

~~15.~~14. A method according to any one of claims 1 to ~~14~~ 13 wherein the sulphur-containing sorbent material is heated to a temperature ≥ 125 °C, preferably ≥ 140 °C.

~~16.~~15. A method according to any one of claims 1 to ~~15~~ 14 wherein the sorbent precursor comprises basic copper carbonate and the sulphur-containing sorbent material is heated to a temperature in the range 140 to 200 °C, preferably 160 to 200 °C, most preferably 160 to 180 °C.

~~17.~~16. A method according to any one of claims 1 to ~~16~~ 15 wherein the heating step is performed under an inert gas selected from nitrogen, argon, helium, carbon dioxide, methane, and mixtures thereof, said inert gas comprising hydrogen sulphide at a concentration lower than that used in the sulphiding step.

~~18.~~17. A method according to any one of claims 1 to ~~17~~ 16 further comprising reducing the sulphided sorbent material in a hydrogen containing gas stream to produce a reduced copper sorbent.

19. A sulphided copper-containing sorbent prepared according to the method of any one of claims 1 to 18.

20. A process for removing mercury from a liquid or gaseous process fluid comprising the step of contacting the process fluid with a sorbent according to claim 19 or prepared according to the method of any one of claims 1 to 18.