[0019a] In an aspect, there is provided a process for the preparation of a mercaptan of formula R-SH, comprising at least the steps of:

a) preparation of a mixture comprising:

1) a disulfide of formula R-S-S-R',

wherein R and R', which are identical or different, represent independently of one another a linear, branched or cyclic hydrocarbon-based radical comprising from 1 to 20 carbon atoms, said chain being saturated or bearing one or more unsaturations in the form of double or triple bond(s), R and R' also being able to form together, and with the sulfur atoms bearing them, a cyclic molecule comprising from 4 to 22 atoms, preferably from 5 to 10 atoms,

2) a catalytic amount of amino acid bearing a thiol group or of a thiol-group-containing peptide,

3) a catalytic amount of an enzyme catalysing the reduction of the disulfide bridge created between two equivalents of said amino acid bearing a thiol group or of said thiol-group-containing peptide,

4) a catalytic amount of an enzyme catalysing the dehydrogenation of the organic reducing compound involved in step b),

5) a catalytic amount of a cofactor common to the two enzymes catalysing the reduction and the dehydrogenation,

b) addition of an organic reducing compound in a stoichiometric amount relative to the disulfide of formula R-S-S-R',

c) carrying out the enzymatic reaction,

d) recovery of the mercaptan of formula R-SH and of the mercaptan of formula R'-SH,

e) optional separation and optional purification of the mercaptan of formula R-SH and/or of the mercaptan of formula R'-SH.

[0019b] In an aspect, there is provided the use of an aqueous solution of enzymatic complex comprising an amino acid bearing a thiol function or a peptide bearing a thiol function, for the synthesis of a mercaptan from a disulfide.

[0019c] In an aspect, there is provided a mixture comprising:

- a disulfide of formula R S S R',
- a catalytic amount of amino acid bearing a thiol group or a thiol-group-containing peptide,
- a catalytic amount of an enzyme catalysing the reduction of the disulfide bridge created between two equivalents of said amino acid bearing a thiol group or to said thiol-group-containing peptide,

- optionally a catalytic amount of an enzyme catalysing the dehydrogenation of an organic reducing compound,
- a catalytic amount of a cofactor common to the two enzymes catalysing the reduction and the dehydrogenation,

where R and R' are as defined above.

CLAIMS

1. Process for the preparation of a mercaptan of formula R-SH, comprising at least the steps of:

a) preparation of a mixture comprising:

1) a disulfide of formula R-S-S-R',

wherein R and R', which are identical or different, represent independently of one another a linear, branched or cyclic hydrocarbon-based radical comprising from 1 to 20 carbon atoms, said chain being saturated or bearing one or more unsaturations in the form of double or triple bond(s), R and R' also being able to form together, and with the sulfur atoms bearing them, a cyclic molecule comprising from 4 to 22 atoms, preferably from 5 to 10 atoms,

2) a catalytic amount of amino acid bearing a thiol group or of a thiol-group-containing peptide,

3) a catalytic amount of an enzyme catalysing the reduction of the disulfide bridge created between two equivalents of said amino acid bearing a thiol group or of said thiol-group-containing peptide,

4) a catalytic amount of an enzyme catalysing the dehydrogenation of the organic reducing compound involved in step b),

5) a catalytic amount of a cofactor common to the two enzymes catalysing the reduction and the dehydrogenation,

b) addition of an organic reducing compound in a stoichiometric amount relative to the disulfide of formula R-S-S-R',

c) carrying out the enzymatic reaction,

d) recovery of the mercaptan of formula R-SH and of the mercaptan of formula R'-SH,

e) optional separation and optional purification of the mercaptan of formula R-SH and/or of the mercaptan of formula R'-SH.

2. Process according to Claim 1, comprising at least the steps of:

a') preparation of a mixture comprising:

- a disulfide of formula R-S-S-R',
- a catalytic amount of amino acid bearing a thiol group or of a thiol-group-containing peptide,
- a catalytic amount of reductase enzyme corresponding to said amino acid bearing a thiol group or to said thiol-group-containing peptide,

- a catalytic amount of NADPH,

b') addition of an organic reducing compound in a stoichiometric amount relative to the disulfide and DMDS) with a catalytic amount of the corresponding dehydrogenase enzyme,

c') carrying out the enzymatic reaction,

d') recovery of the mercaptan of formula R-SH and of the mercaptan of formula R'-SH,

e') separation and optional purification of the mercaptan of formula R-SH and of the mercaptan of formula R'-SH.

3. Process according to any one of the preceding claims, wherein the radicals R and R', which are identical or different, are chosen independently of one another from linear or branched, saturated or unsaturated alkyl, cycloalkyl, aryl, alkylaryl or arylalkyl radicals comprising from 1 to 20 carbon atoms, preferably from 1 to 12 carbon atoms, more preferably still from 1 to 6 carbon atoms and optionally functionalised by one or more functions chosen from alcohol, aldehyde, ketone, acid, amide, nitrile or ester functions or else functions bearing sulfur, phosphorus, silicon or halogen.

4. Process according to any one of the preceding claims, wherein the disulfide of formula R-S-S-R' is dimethyl disulfide.

5. Process according to any one of the preceding claims, wherein the amino acid bearing a thiol group or the peptide bearing a thiol group is chosen from cysteine, homocysteine, glutathione and thioredoxin.

6. Process according to any one of the preceding claims, wherein the organic reducing compound is a hydrogen-donating organic reducing compound bearing a hydroxyl function, chosen from alcohols, polyols, sugars, etc.

7. Process according to any one of the preceding claims, wherein the organic reducing compound is chosen from glucose, glucose 6-phosphate and isopropanol.

8. Process according to any one of the preceding claims, wherein the pH of the reaction is between 6 and 8, preferably between 6.5 and 7.5.

9. Process according to any one of the preceding claims, wherein the organic reducing compound/disulfide molar ratio is between 0.01 and 100, preferably between 0.5 and 5 overall, over the whole of the reaction, entirely preferably said molar ratio is equal to 1.

10. Use of an aqueous solution of enzymatic complex comprising an amino acid bearing a thiol function or a peptide bearing a thiol function, for the synthesis of a mercaptan from a disulfide.

11. Mixture comprising:

- a disulfide of formula R S S R',
- a catalytic amount of amino acid bearing a thiol group or a thiol-group-containing peptide,
- a catalytic amount of an enzyme catalysing the reduction of the disulfide bridge created between two equivalents of said amino acid bearing a thiol group or to said thiol-group-containing peptide,
- optionally a catalytic amount of an enzyme catalysing the dehydrogenation of an organic reducing compound,

- a catalytic amount of a cofactor common to the two enzymes catalysing the reduction and the dehydrogenation,

where R and R' are as defined in Claim 1.

12. Mixture according to Claim 11 comprising:

- a disulfide of formula R-S-S-R',
- a catalytic amount of amino acid bearing a thiol group or a thiol-group-containing peptide,
- a catalytic amount of reductase enzyme corresponding to said amino acid bearing a thiol group or to said thiol-group-containing peptide, and
- a catalytic amount of NADPH,

where R and R' are as defined in Claim 1.