It was discovered according to the invention that the hydroxy-nitrile intermediate (HMTBN or its selenium equivalent) could be converted into 2-hydroxy-4-methylthiobutyric acid (or into seleno-hydroxy-methionine) in a single step, in the presence at least one catalyst and a weak acid. The accessibility and performance of this conversion are such that its conversion to industrial production of the hydroxy analogue of methionine is possible. Compared to the known synthetic methods and the developed improvements which could be made thereto but which are insufficiently beneficial for the conventional industrial methods to be modified, the present invention represents a real advance. Significant yields are obtained in a very short time and this method avoids the consumption of sulfuric acid and the formation of co-products or synthetic intermediates.

The disclosure provides a method for preparing the hydroxy analogue of methionine or the selenium hydroxy analogue of methionine by catalytic conversion of 2-hydroxy-4-methylthiobutyronitrile or 2-hydroxy-4-methylselenobutyronitrile, respectively, said conversion being carried out in the presence of water and at least one weak acid and one catalyst comprising at least one of alumina, titanium dioxide and zirconia.

In one aspect, there is provided a method for preparing 2-hydroxy-4-methylthiobutyric acid (HMTBA) or 2-hydroxy-4-methylselenobutyric acid (HMSeBA) by catalytic conversion of 2-hydroxy-4-methylthiobutyronitrile or 2-hydroxy-4-methylselenobutyronitrile, respectively, characterized in that said conversion is carried out in the presence of water and at least one weak acid and one catalyst comprising at least one of alumina, titanium dioxide and zirconia,
said conversion is carried out in a single step,
and said weak acid is selected from formic acid, acetic acid, propionic acid, linear or branched butanoic acid, pentanoic acid, carbonic acid, glycolic acid, thioacetic acid, cyanoacetic acid, lactic acid, pyruvic acid and oxalic acid.

According to the disclosure, the hydroxy-nitrile compound is directly converted into hydroxy-acid, after conversion of the ammonium salt of the hydroxy-acid according to conventional techniques, without having to resort to a heavy separation step resulting in a considerable economic gain.

Before exposing the invention in more detail, certain terms used in this text are defined.

The term hydroxy acid is used interchangeably with 2-hydroxy-4-methylthiobutyric acid or 2-hydroxy-4-methylselenobutyric acid, considered together or alone. Likewise, the term hydroxy-nitrile refers to both 2-hydroxy-4-methylthiobutyronitrile and 2-hydroxy-4-methylselenobutyronitrile, considered together

or alone, and the term hydroxy-amide refers to 2-hydroxy-4-methylthiobutyramide or 2-hydroxy-4-methylselenobutyramide, considered together or alone.

By weak acid according to the invention is meant any organic or mineral acid whose constant pK_a is at least 1 and at most 10 at 25 °C or any compound or mixture behaving in this way. By way of illustration of a weak organic acid, mention may be made of carboxylic acids and polyacids, which may or may not carry one or more functions, for example selected from OH, C=O, such as acetic acid, formic acid, and by way of illustration of a weak mineral acid, mention may be made of phosphoric acid, dihydrogen phosphate, hydrofluoric acid (HF), hypochlorous acid (HOCl), boric acid (H_3BO_3), sulfurous acid (H_2SO_3), hydrocyanic acid (HCN).

CLAIMS

1. A method for preparing 2-hydroxy-4-methylthiobutyric acid (HMTBA) or 2-hydroxy-4-methylselenobutyric acid (HMSeBA) by catalytic conversion of 2-hydroxy-4-methylthiobutyronitrile or 2-hydroxy-4-methylselenobutyronitrile, respectively, characterized in that said conversion is carried out in the presence of water and at least one weak acid and one catalyst comprising at least one of alumina, titanium dioxide and zirconia,

said conversion is carried out in a single step,

and said weak acid is selected from formic acid, acetic acid, propionic acid, linear or branched butanoic acid, pentanoic acid, carbonic acid, glycolic acid, thioacetic acid, cyanoacetic acid, lactic acid, pyruvic acid and oxalic acid.

2. The method according to claim 1, characterized in that said weak acid is selected from acetic acid, formic acid and propionic acid.

3. The method according to claim 1 or 2, characterized in that the weak acid is in at least one molar equivalent relative to the hydroxy-nitrile, or even in excess, preferably the molar ratio of the weak acid to 2-hydroxy-4-methylthiobutyronitrile or 2-hydroxy-4-methylselenobutyronitrile, ranges from 0.001 to 50.

4. The method according to any one of the preceding claims, characterized in that the catalyst is in a mass concentration of 0.1% to 200% relative to the mass of HMTBN, preferably 0.5% to 100% and better still from 1% to 50%.

5. The method according to any one of claims 1 to 4, characterized in that 2-hydroxy-4-methylthiobutyronitrile or 2-hydroxy-4-methylselenobutyronitrile is in aqueous solution in a concentration ranging from 0.01 M to 10 M, preferably 0.05 M to 1 M.

6. The method according to any one of claims 1 to 5, characterized in that said catalyst has a BET specific surface area of at least 10 m^2/g, preferably at least 50 m^2/g.

7. The method according to any one of claims 1 to 6, characterized in that said catalyst is doped, preferably it is doped with one or more compounds selected from sulfates, phosphates, borates, tungstates, heteropolyacids responding to one of the formulas $H_nXM_{12}O_{40}$ and $H_nX_2M_{18}O_{62}$ in which n is an integer preferably not exceeding 10, X represents Si, Ge, P or As and M represents Mo or W, such as phosphomolybdic acid of formula $H_6P_2Mo_{18}O_{62}$, as well as any other doping compound providing acidity to the catalyst.

8. The method according to any one of claims 1 to 7, characterized in that the conversion is carried out at a temperature ranging from 20 °C to 200 °C, preferably from 50 °C to 180 °C, and better still from 80 °C to 170 °C.

9. The method according to any one of claims 1 to 8, characterized in that it is carried out continuously.