analyte concentration. The two electrodes are arranged behind one another in a fashion that the interferent electrode is located in a diffusion path of a bodily fluid to the working electrode. Thus, the bodily fluid, firstly, contacts the interferent electrode to eliminate interferents. Thereafter, the bodily fluid contacts the second electrode to measure the analyte concentration essentially without interferents. However, the construction of such a kind of analyte sensor is costly since a precise design of the diffusion path is required.

Problem to be solved

It is therefore an objective of the present invention to provide an analyte sensor for determining an analyte concentration in a body fluid and a method for producing an analyte sensor, which at least partially avoid the shortcomings of known analyte sensors and related methods and which at least partially address the above-mentioned challenges.

It is desired that the analyte sensor may allow a precise determination of the glucose concentration although interferents may be comprised by the bodily fluid, wherein no additional calculation step may be required to obtain a precise glucose concentration. Further it may be desirable that the inventive analyte sensor may comprise a simple set-up, thus, being more cost efficient.

It is desired that the analyte sensor is capable of both, firstly, reducing a concentration of interferents that behave in the same manner as a redox mediator and may, thus, directly been oxidized at the working electrode, thereby providing an additional current leading to an overestimated analyte concentration and, secondly, reducing a concentration of interferents that may react with an intermediate product, thereby decreasing a concentration of the intermediate product, thus, diminishing a sensitivity of the analyte sensor, thereby leading to an underestimated analyte concentration.

Summary of the invention

This problem is solved by an analyte sensor for determining an analyte concentration in a body fluid and a method for producing an analyte sensor having the features of the independent claims. Embodiments of the invention, which may be implemented in an isolated way or in any arbitrary combination, are disclosed in the dependent claims and throughout the specification.

In a first aspect of the present invention, an analyte sensor for determining an analyte concentration in a body fluid is disclosed, wherein the analyte sensor is a fully or partially implantable analyte sensor for continuously monitoring an analyte, the analyte sensor comprisinges:

Claims

1. An analyte sensor ~~(130)~~ for determining an analyte concentration in a body fluid ~~(132)~~, wherein the analyte sensor is a fully or partially implantable analyte sensor for continuously monitoring an analyte, comprising
   - a substrate ~~(134)~~ having a first surface ~~(136)~~, the first surface ~~(136)~~ being configured to be faced towards the body fluid ~~(132)~~ comprising the analyte;
   - a working electrode ~~(140)~~;
   - an interferent electrode ~~(142)~~; and
   - at least one further electrode ~~(144)~~ selected from the group consisting of a counter electrode ~~(146)~~, a reference electrode and a counter/ reference electrode;

   wherein each of the working electrode ~~(140)~~ and the interferent electrode ~~(142)~~ comprises a layer ~~(210)~~ of a conductive material ~~(212)~~, wherein the working electrode ~~(140)~~ further comprises at least one enzyme, whereas the interferent electrode ~~(142)~~ is devoid of enzyme, and wherein the interferent electrode ~~(142)~~ and the working electrode ~~(140)~~ are electrically separated layers located adjacently on the first surface ~~(136)~~ of the substrate ~~(134)~~.

2. The analyte sensor ~~(130)~~ according to claim 1, wherein the working electrode ~~(140)~~ occupies a first portion ~~(160)~~ of the first surface ~~(136)~~ and wherein the interferent electrode ~~(142)~~ occupies a second portion ~~(162)~~ of the first surface ~~(136)~~, wherein the second portion ~~(162)~~ at least partially surrounds the first portion ~~(160)~~.

3. The analyte sensor ~~(130)~~ according to any one of claims 1 or 2, wherein the substrate ~~(134)~~ further has a second surface ~~(138)~~, the second surface ~~(138)~~ being faced away from the first surface ~~(136)~~ of the substrate ~~(134)~~, wherein the at least one further electrode ~~(144)~~ is located on the second surface ~~(138)~~ of the substrate ~~(134)~~.

4. The analyte sensor ~~(130)~~ according to any one of claims 1 to 3, further comprising
   - a diffusion limiting membrane ~~(170)~~ at least covering the working electrode ~~(140)~~.

5. The analyte sensor ~~(130)~~ according to claim 4, wherein the diffusion limiting membrane ~~(170)~~ is covering both the working electrode ~~(140)~~ and the interferent electrode ~~(142)~~.

6. The analyte sensor ~~(130)~~ according to any one of claims 4 or 5, wherein a thickness ~~(172)~~ of the diffusion limiting membrane ~~(170)~~ exceeds a diameter ~~(174)~~ of the working electrode ~~(140)~~.

7. The analyte sensor ~~(130)~~ according to claim 6, wherein the thickness ~~(172)~~ of the diffusion limiting membrane ~~(140)~~ is in the range from 20 µm to 50 µm.

8. The analyte sensor ~~(130)~~ according to any one of claims 4 to 7, wherein the electrically separated layers of the working electrode ~~(140)~~ and of the interferent electrode ~~(142)~~ are separated from each other by a distance ~~(148)~~, the distance ~~(148)~~ being in the range from 0.5 to 2.0 of the thickness of the diffusion limiting membrane ~~(170)~~.

9. The analyte sensor ~~(130)~~ according to any one of claims 1 to 8, wherein the interferent electrode ~~(142)~~ is operable at a same potential applied to the working electrode ~~(140)~~.

10. The analyte sensor ~~(130)~~ according to any one of claims 1 to 9, wherein the analyte comprises glucose, wherein the enzyme is at least one of glucose oxidase or glucose dehydrogenase.

11. A method for producing an analyte sensor ~~(130)~~, in particular the analyte sensor ~~(130)~~ according to any one of claims 1 to 10, wherein the analyte sensor ~~(130)~~ is configured for determining an analyte concentration in a body fluid ~~(132)~~, wherein the analyte sensor is a fully or partially implantable analyte sensor for continuously monitoring an analyte, the method comprising the steps of:

a) applying a layer ~~(210)~~ of a conductive material ~~(21)~~ to a first surface ~~(136)~~ of a substrate ~~(134)~~, the first surface ~~(136)~~ being configured to be faced towards the body fluid ~~(132)~~ comprising the analyte, in a manner that two electrically separated layers are obtained in a first portion ~~(160)~~ of the first surface ~~(136)~~ and a second portion ~~(162)~~ of the first surface ~~(136)~~;

b) further applying a layer ~~(220)~~ of a composition ~~(222)~~ comprising an enzyme onto the conductive material ~~(212)~~ in a manner that a working electrode ~~(140)~~ is formed on the first portion ~~(160)~~ covered by the composition ~~(222)~~ comprising the enzyme and that an interferent electrode ~~(142)~~ is formed on

the second portion ~~(162)~~ being devoid of the composition ~~(222)~~ comprising the enzyme;

c) forming at least one further electrode ~~(144)~~ selected from the group consisting of a counter electrode ~~(146)~~, a reference electrode and a counter/ reference electrode on the substrate ~~(134)~~.

12. The method according to claim 11, wherein step a) comprises:

- applying a first individual layer ~~(214)~~ of the conductive material ~~(212)~~ onto the first portion and ~~(160)~~ a second individual layer ~~(216)~~ of the conductive material ~~(212)~~ onto the second portion ~~(162)~~ in a manner that the first portion ~~(160)~~ and the second portion ~~(162)~~ are electrically separated from each other; or
- applying the layer ~~(210)~~ of the conductive material ~~(212)~~ onto the first surface ~~(136)~~ and removing the conductive material ~~(212)~~ between the first portion ~~(160)~~ and the second portion ~~(162)~~.

13. The method according to any one of claims 11 or 12, wherein step b) comprises:

- further applying the layer ~~(220)~~ of the composition ~~(222)~~ comprising the enzyme onto the conductive material ~~(212)~~ on the first portion ~~(160)~~ in a manner that the conductive material ~~(212)~~ on the second portion ~~(162)~~ is maintained devoid of the composition ~~(222)~~ comprising the enzyme; or
- further applying the layer ~~(220)~~ of the composition ~~(222)~~ comprising the enzyme onto the conductive material ~~(212)~~, subsequently removing the composition ~~(222)~~ comprising the enzyme from the second portion ~~(162)~~ and maintaining the composition ~~(222)~~ comprising the enzyme on the first portion ~~(160)~~.

14. The method according to any one of claims 11 to 13, wherein step c) comprises applying a second layer ~~(224)~~ of the conductive material ~~(212)~~ to a second surface ~~(138)~~ of the substrate ~~(134)~~, the second surface ~~(138)~~ being faced away from the first surface ~~(136)~~ of the substrate ~~(134)~~.