Patent claims

1. Device for optically measuring substance concentrations or biomarkers in a sample,
with a contact surface that can be brought into contact with the sample during a measurement process, and
optoelectronic components in the form of a plurality of optical emitters for emitting photons, and
a plurality of detectors for receiving at least some of the photons emitted by the emitters and passing through at least a partial volume of the sample, and
wherein the emitters and the detectors are located in a common plane,
and at least nine emitters are provided,
and at least three detectors are provided,
and the emitters and detectors are mounted at a distance of less than 15 mm from the contact surface,
wherein there are at least three wavelength intervals which do not overlap and which have an interval length between 2 nm and 20 nm, and in each of the wavelength intervals at least the peak wavelength of three of the emitters lies, and
in each wavelength interval, at least two of the emitters, both of which are within the wavelength interval, have a difference in peak wavelength of at least 0.5 nm.

2. Device according to claim 1, characterized in that the device is intended for non-invasive measurement on living beings.

3. Device according to claim 2, characterized in that there are pairs of emitters and detectors and, for each wavelength interval, there are at least two pairs of emitters and detectors in which the distance from the emitter to the detector differs by at least 50% from the distance between the emitter and detector of the other pair.

4. Device according to claim 2, characterized in that the contact surface consists of at least one transparent material and at least one non-transparent material.

5. Device according to claim 1, characterized in that the device is integrated into a smartphone and uses at least one of the cameras of the smartphone as at least one of the detectors.

6. Device according to claim 1, characterized in that it has at least four cavities which are surrounded on all sides except one by non-transparent material and in which there is either at least one emitter or one detector.

7. Device according to claim 1, characterized in that the control of the emitters is designed such that the emitters can be activated one after the other and individually in a sequence and the brightness detected by each detector for the step of the sequence can be fed to a data processing device.

8. Method for the optical measurement of substance concentrations or biomarkers in a sample consisting of human skin, wherein a measuring device has a sensor surface which is a contact surface of the measuring device to the skin,

and the contact surface to the skin has partial surfaces that are not transparent, and the contact surface to the skin has partial surfaces that are sufficiently transparent so that photons can be emitted and detected through the contact surface,

and at least nine emitters and at least three detectors are located on a common plane

and the emitters and detectors are mounted at a distance of less than 15 mm from the contact surface,

and the emitters are switched on in a measurement sequence,

and switched-on emitters emit photons that penetrate the skin through the sensor surface,

and some of the emitted photons pass through the skin, interact with it, exit it, pass through the sensor surface again, and are then detected by one of the detectors of the measuring device,

wherein at least three wavelength intervals of optoelectronic components exist, that do not overlap and have an interval length between 2 nm and 20 nm, and in each of the wavelength intervals at least the peak wavelength of three of the emitters lies,

and in each of these intervals there are at least two optoelectronic components that differ in their wavelength,

and the performance of the measurement enables the determination of physiological states of an individual and/or the measurement of the concentration of substances in the human body.

9. Method according to claim 8, characterized in that

in each wavelength interval, at least two of the emitters, both of which are within the wavelength interval, have a difference in peak wavelength of at least 0.5 nm.

10. Method according to claim 8, characterized in that

for a first emitter-detector pair, a first measured value for the quantity of detected photons is recorded, and
for a second emitter-detector pair, a second measured value for the quantity of detected photons is recorded, and
the emitter of the first emitter-detector pair is in the same wavelength interval as the emitter of the second emitter-detector pair, and
the emitter of the first emitter-detector pair differs from the emitter of the second emitter-detector pair by the difference in the peak wavelength of the emitter, and
the difference in the peak wavelength of the emitter causes a difference between the first measured value and the second measured value, and
the measured values are recorded separately so that the difference between the measured values can be evaluated to enable an increase in the accuracy of the substance concentration determination.

11. Method according to claim 8, characterized in that the differences in the peak wavelengths of the emitters are included in the calculation of the concentration of the analyte.

12. Method according to claim 8, characterized in that
for a first emitter-detector pair, a first measured value for the quantity of detected photons is recorded, and
for a second emitter-detector pair, a second measured value for the quantity of detected photons is recorded, and
the emitter of the first emitter-detector pair is in the same wavelength interval as the emitter of the second emitter-detector pair, and
the emitter of the first emitter-detector pair differs from the emitter of the second emitter-detector pair by the difference in the peak wavelength of the emitter, and
the difference in the peak wavelength of the emitter causes a difference between the first measured value and the second measured value, and
the measured values are recorded separately,

and the measured values and data recorded or measured during the production process of the measuring device is used for the substance concentration determination.

13. Method according to claim 8, characterized in that measurement data from measuring devices placed on the market can be stored for evaluation,
or in that the measuring devices are equipped with at least one data storage device.

14. Method according to claim 13, characterized in that the measured data which is stored is raw optical data from which the properties of individual emitters can be inferred.

15. Method according to claim 8, characterized in that nutritional recommendations are calculated and issued on the basis of the measured substance concentrations.