Preparation of durable nanostructured surfaces with immobilized bioactive molecules

Development status

Phase 4

The transition from the prototype to the final and fully functional form. At this stage, the prototype is already fully tested, or the technology is certified and ready for mass deployment.

IP protection status

CZ Patent nr. 308162 Equipment for the preparation of a nanostructured superhydrophobic surface layer with a radially symmetrical wetting gradient

Partnering strategy

Co-development, Collaboration, investment, licensing

Institution

Challenge

The technology introduces a surface layer with a radially symmetrical wetting gradient that allows a defined drying of an analyte drop (liquid substance) where the drop is localized and fixed at one point in the surface, in a superhydrophobic mode (hydrophobic – non-wetting – materials repel water. The drops do not soak in them, they remain in spherical form). On the standard planar superhydrophobic surface, the drop of the analyte does not hold and flows, which makes it impossible to define a defined drizzle in a fully superhydrophobic mode. Using radial wetting gradients can achieve hydrophobic surfaces where the fixed drop in the condensation centre has minimal contact with the supporting surface. The radial wetting gradient solves the problem of fixation of an analyte drop in superhydrophobic mode on the surface. The gradient surface is characterized by a very small wetting on its edge, which increases towards its center.

Description

The solution to the need to place the analyte at one point is the nanostructured superhydrophobic surface layers with a radially symmetrical wetting gradient according to this invention. Nanoparticles are applied to the surface of the supporting substrate by increasing the amount of nanoparticles per unit of the carrier substrate towards the edges of the surface layer from the centre of the surface layer. The prepared nanostructured superhydrophobic surface layer allows a defined drying of the drop of the analyte, when the drop is localized and fixed at one point of the planar surface, in superhydrophobic mode. The object of the invention is also a device for the implementation of the method of preparation of a nanostructured superhydrophobic surface layer on a supporting substrate with a radially symmetrical wetting gradient. The device shall include at least one depository chamber for the insertion of the supporting substrate and at least one nanoparticle source for the generation of a bundle of

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nanoparticles into the deposition chamber.

Commercial opportunity

Nanostructured superhydrophobic surface layers with radially gradient wetting created in a way and in the equipment according to this invention are used in diagnostic methods, in physicochemical-biological methods, when it is necessary to fix a drop of analyte in one place, or to have it defined to dry on the smallest possible surface. These surfaces are used, for example, in the drop coating deposition raman spectroscopy (DCDR) method for defined sample concentration. Another applicable method using radial gradient surfaces is mass spectrometry with laser desorption and ionization (MALDI-TOF) or surface-reinforced infrared spectroscopy (SEIRA), respectively surface-reinforced Raman spectroscopy (SERS) and surface-reinforced laser desorps/ionization (SELDI) when narural material exhibits plasmanic behaviour. Specific companies can be focused on the field of mass spectrometry, microscopy or production of laboratory material.