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DETECTION OF MICRO-PARTICLES VARIABILITY

METHOD AND SYSTEM FOR SIMULTANEOUS DETECTION OF MICRO-PARTICLES OF VARIOUS CONCENTRATIONS,MORPHOLOGICAL AND PHYSIOLOGICAL TRAITS IN SUSPENSIONS

Application area
Efficient detection of microparticles in fluids and gases

Patent
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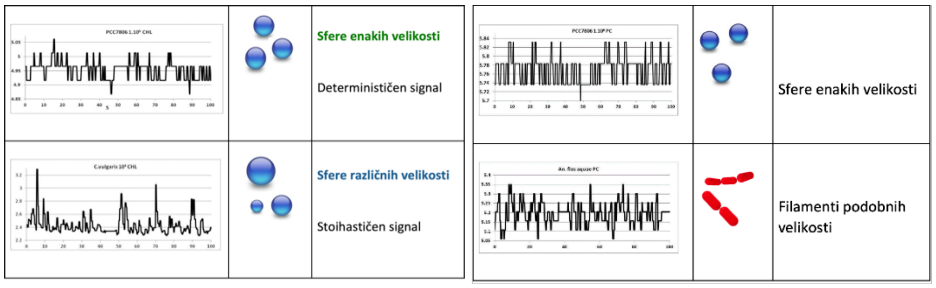
Method description

The method described is applicable to the detection and monitoring of microparticles, their various associations and aggregates of different shapes and sizes, such as microorganisms and other organic and inorganic particles in suspension, capable of absorbing and/or emitting radiation of different wavelengths. Importantly, this non-invasive method allows for the conservation of the properties of individual elements and whole populations of microparticles to be maintained in suspension, in either a liquid or gaseous phase, by creating a steady low turbulence stream, allowing them to pass into the detection area as averaged populations.

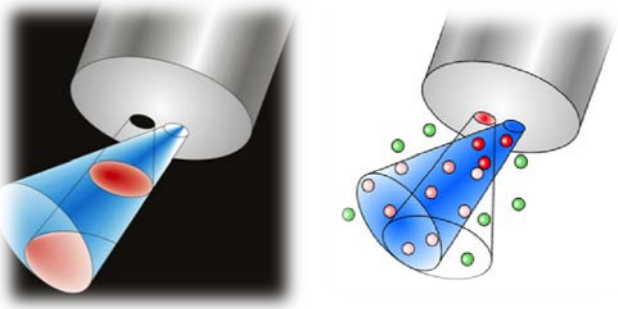
Advantages of the method

An exceptional advantage of this method is the ability to determine the number, structure, shape and composition of microparticles, their aggregations and assemblies by a non-invasive methodology .The method uses pulse-induced high frequency illumination to track the changes in properties and their states in real time.

This is the only known method for simultaneously obtaining the above information, without interference with the structure of the associations, which makes it possible to make a low-cost micro-particle detection device based on these principles.



Records of signals, different responses of microparticles in suspension or their mixtures according to their size (left) and shape (right).



The figure shows particle detection in a non-homogeneous excitation area (left). When passing through the sensor detection space, the particles respond differentially. Microparticles in the optimal position trigger the strongest response (red).

Areas of application

The patent is applicable for specific tracing in many areas of particle detection in a particular system.

Microorganisms:
-The homogeneity / heterogeneity of cultures of bacteria, algae and fungi, useful in the food industry, such as dairy production, brewing, etc;
-Quantitative and qualitative detection of differently labeled elements in cell cultures, e.g. in mixed spheroids, growth such as quality of production tracking in bioreactors, applied in the medical biotechnology, pharmaceutical and cosmetic industries.

Inorganic particles:
Production of materials - in the control of the homogeneity and behavior / activity of various microparticles in suspension, sensing by laser technologies;
-Air quality and detection of the presence of specific microparticles;
-Determination of impurities present in microparticle associations in various raw materials;
-Tracking and behavior of nanoparticles under various physicochemical conditions.

Scientific research in all the fields described above.

Specific use

The principle has also been tested in a pilot prototype - a solar-powered robotic vessel that detects the concentration of various phytoplankton organisms in water bodies and distinguishes them by state, shape and origin

Awarded1st prize at the 2018 ENERGY PLANET Slovenia Competition for innovative technologies to control cyanobacteria blooms using a fully sustainable autonomous robotic solar powered vessel.

Various options to upgrade detection system - examples

Using two or more sensors the program can be upgraded to align signals to the same time base regardless of the excitation frequency used.

Development of user-friendly computer programmes for automatic on-line signal analysis.

Calculation of the average value of a single signal (particle concentration).

Monitoring of characteristic deviations and their surface area from the average signal (particle shape and their aggregation).

Provides a reliable and stable (steady) manner for particles passing through the detection area in the medium.

Enables measurements and adjustment of the speed of particle travel.