



## Optical microscope for obtaining quantitative images of samples without staining

### DESCRIPTION OF THE TECHNOLOGY

Diabetes mellitus (DM) is one of the diseases with the greatest socio-health impact, not only because of its high prevalence, but also because of the chronic complications it produces and its mortality rate. In Spain more than five million people suffer from diabetes.

Currently, type 1 diabetes mellitus (DM1) is diagnosed and controlled by high performance liquid chromatography (HPLC). This procedure is carried out in an external laboratory at a cost of tens of euros and takes two days, so it is interesting to have a device which saves time and money, especially considering the high number of patients.

Research staff at the University of Valencia propose a new system for diagnosing diseases that cause morphological changes in erythrocytes, one of the main applications being the detection of diabetes mellitus. Specifically, the proposed technology makes it possible to differentiate between people affected by DM1 and those not affected, by means of a differential analysis of alterations in phase map distributions in samples of erythrocytes.

The patented technology consists of a tool that can be used for minimally invasive diagnosis, as it only requires a capillary blood sample, can be performed at any time, and provides real-time

### MARKET APPLICATION SECTORS

The technology is applicable in any field that requires quantitative information from microscopic samples in a non-invasive way, such as small hospitals, clinics or health centres and entities such as NGOs that need fast, mobile and accurate diagnostic units.

### TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

The main advantages of this invention are:

- Screening in real time.
- It only requires a drop of blood obtained by finger puncture.
- Minimally invasive.
- Ease of adaptation to a conventional microscope.
- High resolution even for microscopic samples.

### CURRENT STATE OF DEVELOPMENT

The technology received a grant from the Valencian Innovation Agency that allowed it to carry out a proof of concept of the device and validate it at the laboratory level, reaching TLR4.

### INTELLECTUAL PROPERTY RIGHTS

The technology is protected through the Spanish patent application and the PCT/ES2020/070101 application, entitled "Wavefront Microscope by spatial multiplexing of flat waves" and priority date 15/02/2019. In addition, there is a favorable "State of the Art Report" that confirms the patentability of the

results. Furthermore, it does not require the use of disposable material or action by specialised personnel.

Specifically, a system has been developed, which incorporates a millilitre matrix, and which allows the amplitude and phase of the wavefront structure from microscopic samples to be calculated. These phase variations are presented, in real time, on high resolution maps, which allows the morphological variations of transparent microscopic samples to be quantified.

This technology requires minimal modification to the configuration of a conventional microscope for its implementation, so adapting conventional microscopes to this system would be simple.

The research staff has achieved the precise measurement of possible morphological changes in erythrocytes in certain diseases, so its application is not restricted to DM1, but would also be useful for the detection of diseases such as anaemia and malaria.

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#### COLABORATION SOUGHT

- Use and exploitation license agreement.
- Subcontracting agreement with another company.
- R&D project to advance development.

#### RELATED IMAGES

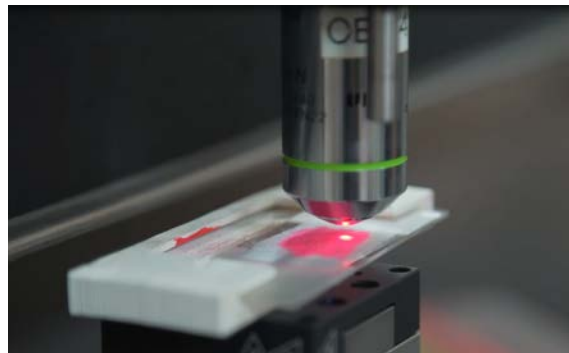


Figure 1. Image of DM1 diagnostic procedure

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