

Mini-labs for rapid diagnostic tests will soon be mass-produced in Europe

The European Commission has awarded 15 million Euros to an international consortium carrying out extensive research into the next generation of lab-on-a-chip systems. So-called mini-labs using foil-based microfluidics for rapid diagnostics kits can then be mass-produced in Europe, with possible application in COVID-19 detection.

There is great potential for microfluidic lab-on-a-chip systems, particularly in medicine, pharmaceuticals, production and analysis. The H2020 project, "NextGenMicrofluidics", was granted to a consortium coordinated by JOANNEUM RESEARCH, an Austrian Research and Technology organisation. The partners of NextGenMicrofluidics operate an Open Innovation Test Bed, a new EU format similar to pilot lines. "One advantage of lab-on-a-chip systems is that they allow the automated implementation of complex analyses even in small laboratories with limited technical equipment," said Martin Smolka, Project Manager, JOANNEUM RESEARCH. "This joint project accelerates the implementation of roll-to-roll technologies for the high-throughput production of microfluidic systems. We will then produce microfluidic components no longer as single pieces, but on large foils using stamping, printing and lamination processes. This works in a similar way to newspaper printing. As a result, we will be heading towards an unrivalled level in the production capacity of flexible lab-on-a-chip systems, so-called labs-on-a-foil", stated Smolka.

NextGenMicrofluidics is addressing this challenge by establishing an Open Innovation Test Bed for the development and production of lab-on-a-foil systems on large area polymer foils. This will enable mass production of several million lab-on-a-foil systems per year, important, for example, for the production of rapid tests for medical diagnosis. Smolka explained some technical details: "Injection molding and wafer-based glass and silicon processing complement the platform as well as other technologies such as high-resolution printing of biomolecules in the form of the world's first roll-to-roll microarray spotter for foil-based microfluidics. These unique facilities are combined in the Open Innovation Test Bed."

The Open Innovation Test Bed offers all services required for the development and production of microfluidic systems. These services range from simulation based design through molecular assay development, material development and biofunctionalisation to production as well as quality assurance.

As a one-stop shop for this unique technology portfolio, the Open Innovation Test Bed offers its customers the advantage of a fast and cost-effective transfer of new diagnostic or analytical concepts

into ready-for-market products. Thus, with microfluidic systems novel, pioneering innovations can be attained at competitive prices.

Within the framework of the project, the consortium offers funding opportunities for innovation projects, in which future customers will be able to contract for product development. Parallel to the technical development, the Open Innovation Test Bed will provide its customers with access to venture capital.

Point-of-Care-Diagnostic for SARS-CoV -2

The technology validation of the Open Innovation Test Bed is established on pre-defined case studies from complementary markets, ranging from biosensor development through molecular diagnostics and smart phone-supported home diagnostics to pharmaceutical tests as well as sensors for monitoring bioprocesses and food safety.

Particular attention is paid to lab-on-a-foil systems in medical diagnostics, especially in the area of patient-related rapid diagnostics, so-called point-of-care diagnostics and their use in the current COVID-19 crisis. By developing and upscaling new rapid diagnostic tests for SARS-CoV-2, the consortium aims to contribute to solving this crisis. A holistic approach is being pursued, which includes rapid diagnostic tests for acute infections as well as for immunity after a past infection. The aim is to develop systems for the point-of-care diagnosis of SARS-CoV-2 as well as the corresponding immune status and to manufacture more than one million tests per month in Europe. This high-throughput production is essential, especially for rapid diagnostic tests in times of a pandemic, so that a large number of tests can be used decentrally as diagnostic tools, e.g. by the family doctor, and provide test results quickly and efficiently.

For this purpose, the tests will be implemented in sensor platforms already commercialized by the project partners BiFlow® and GENSPEED® and the manufacturing processes of the required lab-on-a-foil systems will be scaled-up. The tests will be developed and manufactured in Europe and will therefore be available immediately for an acute crisis in the future.

"Through the collaboration of interdisciplinary competencies in NextGenMicrofluidics, we have the unique opportunity of optimizing manufacturing of our lab-on-a-chip technology platform," said Jörg Nestler, CEO, BiFlow Systems. He is confident that the further development of his technology platform for the direct detection of SARS-CoV-2 will contribute to the fight against the COVID-19 pandemic.

Max Sonnleitner, CEO of GENSPEED Biotech, spoke enthusiastically about the advantages of these novel production processes: "We will have available the lab-on-a-foil systems we need in large quantities at low prices. This will allow us to deliver large quantities of rapid antibody tests for SARS-CoV-2 quickly".

About NextGenMicrofluidics

The project combines the competences of 21 companies and research organizations along the entire value chain and offers services for the development and production of customized microfluidic lab-on-a-foil systems for companies - from start-ups to large industry. This includes a unique continuous roll-to-roll production line for high-throughput manufacturing of foil-based microfluidics.

The companies and research organizations forming the consortium are: JOANNEUM RESEARCH Forschungsgesellschaft mbH (coordination), BiFlow Systems GmbH, BioNanoNet Forschungsgesellschaft mbH, bionic surface technologies GmbH, Condensia Química S.A., Erba Technologies

Austria GmbH, Fundación TECNALIA Research and Innovation,,GENSPEED Biotech GmbH, ibidi GmbH, Biomedical Research Foundation of the Academy of Athens, Infineon Technologies Austria AG, Inmold A/S, Innovative Technologies in biological System, S.L., Micronit Microtechnologies B.V., micro resist technology - Gesellschaft für chemische Materialien spezieller Photoresistsysteme mbH, NATURSTOFF-TECHNIK GMBH, RESCOLL – Société de Recherche, SCIENION AG, University of Split, Technische Universität Graz and temicon GmbH

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Contribution of temicon GmbH

temicon provides a Rapid Prototyping process, which allows the fast realization of microfluidic chips from design to prototype within a few days at lowest cost and high output. In this process temicon applies its expertise in the development of advanced coating processes for large areas (up to 20"x24") and thick film UV-Lithography. Once the final microfluidic design is validated by prototype tests, temicon transfers the master design to a durable metallic copy, which is used for the high-throughput roll-to-roll production of microfluidic chips. Furthermore, temicon develops and fabricates film based optical microstructures, which are used for photonic sensors within lab-on-a-foil solutions.

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