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If Machines Could Smell ...

Fraunhofer IPA drives Biological Transformation with an innovative platform

What, if robots could smell? Sniffing explosives at the airport, diagnosing diseases based on a patient's breath, locating gas leaks and much more? As part of its lighthouse topic "Biological Transformation", the Fraunhofer Institute for Manufacturing Engineering and Automation IPA in Stuttgart is now increasingly connecting biological and technical systems. A new platform technology is developed to automatically manufacture cell-based sensors and make them economically usable.

For the economical use of biological sensors, Fraunhofer IPA is developing a technology that automatically produces cell-based biosensors. Such sensors could then give machines, for example, a sense of smell. The platform is initially validated on a product of the Californian start-up Koniku. However, it will later also be used for other applications. IPA project manager Martin Thoma sums up the innovation: "We are basically developing a generic tool that will enable cell-based biological sensors for industrial use in the medium term." Biology and technology merge.

The project is supported by the Baden-Württemberg Ministry of Economic Affairs, among others. With biointelligent products and the associated production technologies, new value creation potentials can emerge for the innovation area and industrial location of Baden-Württemberg. The project aims to realize them for the country's economy.

In order to enable the targeted development of an economically usable product, Fraunhofer IPA will develop a screening process for receptor selection and reliable automated production of so-called transfected cells, i.e. cells in which foreign DNA or RNA is integrated.

The US-company Koniku has been cultivating such cells for several years now. Olfactory receptors are introduced on small autonomous optical selection units by Koniku. The cells can be kept alive and are functional for an extended period of time to detect tiny particles from the environment. However, there are still many unanswered questions in this field of research.

To determine the right olfactory receptor for a specific application, several thousand receptors and their combination must be screened. For this process to become economical, a platform is needed that makes it possible to automatically modify cells, i.e. transfect them, and then examine them for their specific reaction to smells and tastes. With such a transfection and screening platform, it would be possible to modify the

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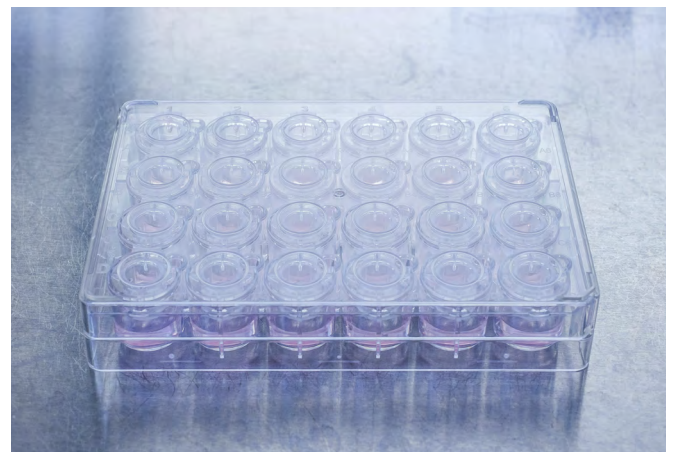
cells very quickly for different olfactory stimuli and thus to open up other areas of application, such as medical diagnostics. "I am particularly excited about being able to deploy the Konikore in every home in a few years," says Osh Agabi. Founder and CEO of Koniku Inc. "A solution which can help people detect or screen disease at the earliest stages, naturally some hurdles remain to accomplish this goal nevertheless, step by step we are moving closer to this reality. The partnership with Fraunhofer IPA is another key milestone laid in this journey."

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With a transfection and screening platform, it is possible to modify cells very quickly for other olfactory stimuli, thus opening up other areas of application, such as medical diagnostics. Source: Fraunhofer IPA



To determine the right odour receptor for a specific application, several thousand receptors and their combination must be screened. This is only economical when automated.

Source: Fraunhofer IPA

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With nearly 1000 employees, the **Fraunhofer Institute for Manufacturing Engineering and Automation IPA**, Fraunhofer IPA, is one of the largest institutes in the Fraunhofer-Gesellschaft. It has an annual budget of approximately 63 million euros, of which more than one third derives from industrial projects. The institute's research focus is on organizational and technological aspects of production. We develop, test and implement not only components, devices and methods, but also entire machines and manufacturing plants. Our 15 departments are coordinated via six business units, which together conduct interdisciplinary work with the following industries: automotive, machinery and equipment industry, electronics and microsystems, energy, medical engineering and biotechnology as well as process industry. The research activities of Fraunhofer IPA aim at the economic production of sustainable and personalized products. We regard cyber-physical production processes as topics of the future.