EU H2020 FET Open project DeDNAed

DeDNAed - Cluster decorated recognition elements on DNA origami for enhanced Raman spectroscopic detection methods

DeDNAed started on March 1st, 2021 with a duration of 36 months.

What is DeDNAed about? What are its objectives?

The project "DeDNAed" intends to develop a novel, innovative biosensing platform whose advantages and benefits are in terms of sensitivity, versatility and being ultrafast by an optical approach. Our platform will be based on the assembly and integration of sensing elements (transducer and bioreceptor) by DNA origami. The DNA origami will serve as a “nano breadboard” in order to precisely control the position of these elements and thus the sensor architecture at the nanometer scale.

Metallic atomic clusters are integrated into a biological marker molecule (DNA or antibody) and thus represent the biological sensor element. This is specifically integrated into a nanoarray made of additional metallic nanoparticles precisely controlled by a DNA origami template and will lead to a significant increase in signal. DNA origami serves as an individually inter- and intramolecularly programmable “nano breadboard”. A DNA origami consists of a single strand of DNA, folded by a thermal treatment and certain staple strands into any shapes (2D as well as 3D, dimensions of approx. 100 nanometers). So-called "sticky ends" on the surface of the DNA origami offer the possibility of an individual implementation of the sensing elements and nanoparticles, by means of correspondingly complementary oligonucleotides with a resolution of approx. 2 nm. When the analyte binds to the sensor element, a change in the Raman signal can be detected without major delay using surface-enhanced Raman spectroscopy (SERS). This sensor method is not limited to a specific biomarker molecule for the sensor element, but can be transferred to different marker molecules. This results in a high degree of flexibility in the area of application, reaching from medical technology to food monitoring. In addition, a transfer of the DNA origami-based sensor platform to flexible, textile substrates will be developed using lipid bi-layers and the Langmuir-Blodgett method for later use as a wipe test or medical wearable.

Who are DeDNAed’s beneficiaries?

Seven beneficiaries from four different countries collaborate in the DeDNAed project:

- TECHNISCHE UNIVERSITAET CHEMNITZ (Project Coordinator, Germany)
- ASOCIACION CENTRO DE INVESTIGACION COOPERATIVA EN BIOMATERIALES- CIC biomaGUNE (Spain)

- KURT-SCHWABE-INSTITUT FUR MESS- UND SENSORTECHNIK MEINSBERG EV (Germany)
- UNIVERSITE DU MANS (France)
- UNIVERSITAET POTSDAM (Germany)
- FUNDACION TECNALIA RESEARCH & INNOVATION (Spain)
- BIONANONET FORSCHUNGSGESELLSCHAFT MBH (Austria)

DeDNAed Kick-off meeting

The DeDNAed Kick-off meeting took place virtually due to the ongoing SARS-COV-2 pandemic, on March 18th, 2021. The meeting allowed all partners of the consortium to start good relationships among them. All partners were provided with general information about the project and about the administrative and management procedures that will be followed during project execution. Additionally, the partners had fruitful discussions about the scientific work to be carried out in each work package. DeDNAed's kick-off meeting was the first step for a successful execution of this FET OPEN project.

CIC biomaGUNE's role in the project is the design, synthesis, and characterization of different sensing biorecognition elements (antibodies and DNA aptamers) in pure state and modified with metallic and semiconductor atomic clusters. We will also design, synthesize, and provide metallic nanoparticles of different size and shape as amplifiers of optical read out signals.

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