

Electrochemical Biosensors

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Hahn-Schickard
Freiburg, Germany

How can we support your biosensor development?

We support you in achieving your **assay goals** in terms of **sensitivity, selectivity, portability and robustness**.

We research and develop electrochemical biosensors based on **DNA probes** that can **detect nucleic acids, proteins, or small molecules** on **various electrode substrates**.

Aptasensing

Electrode
functionalization

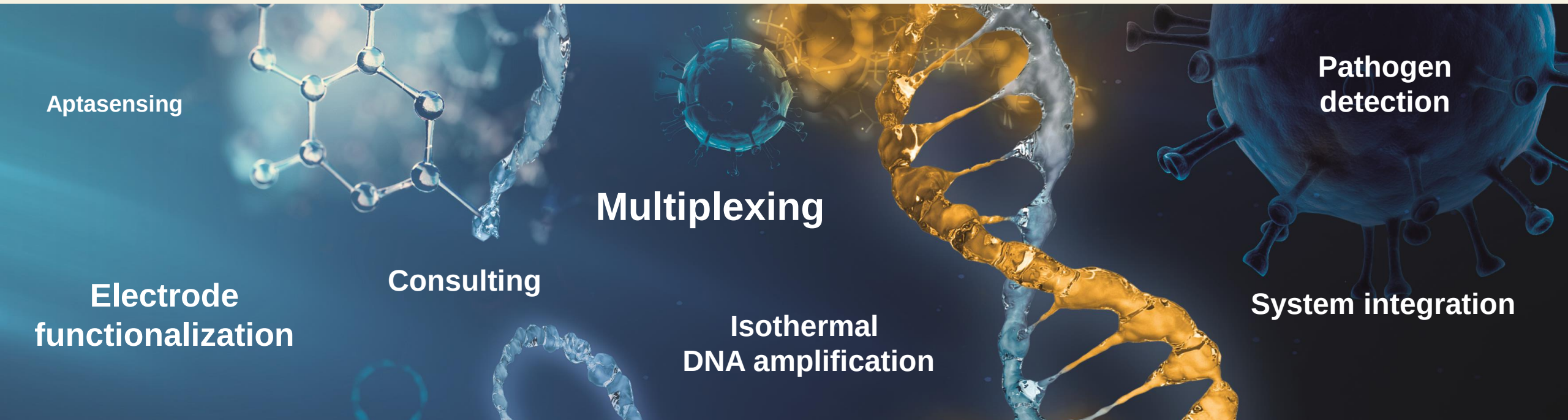
Consulting

Multiplexing

Isothermal
DNA amplification

Pathogen
detection

System integration



Electrode functionalization & characterization

- Thiolated probes on gold
- Covalent immobilization on carbon electrodes
- Blocking
- Determination of probe density

Microfluidic system integration

- Sample-to-answer system integration
- Mikrofluidic cartridge development

Assay development and optimization

- Probe-based DNA/RNA real-time amplification
- Sample-to-answer pathogen detection
- Multiplex detection
- Apta- and Immunosensing

Assay transfer

- Your assay from optical to electrochemical readout
- Your assay from expensive electrodes to cost-effective carbon electrodes

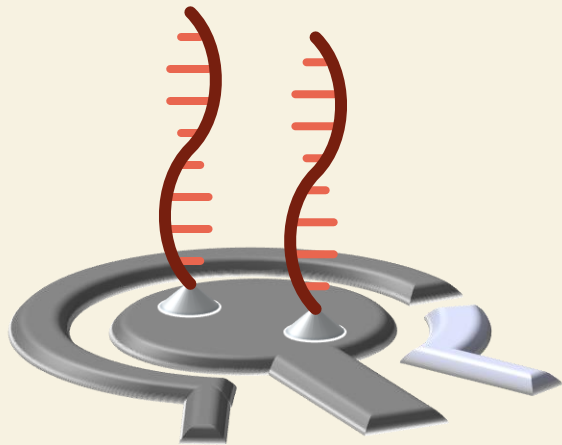
Electrode functionalization & characterization

Grafting of DNA probes

- ... for DNA/RNA detection
- ... for aptasensing
- ... and blocking against adsorption

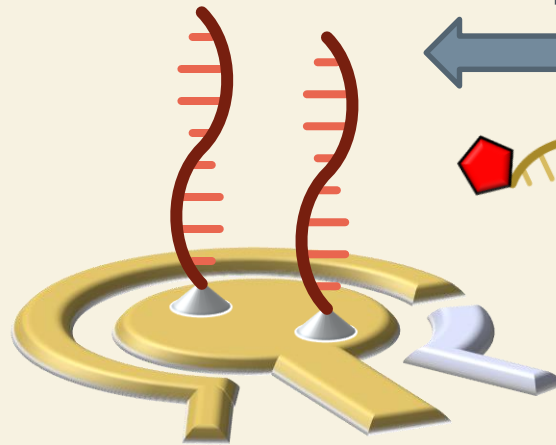
Characterization

- ... of probe density



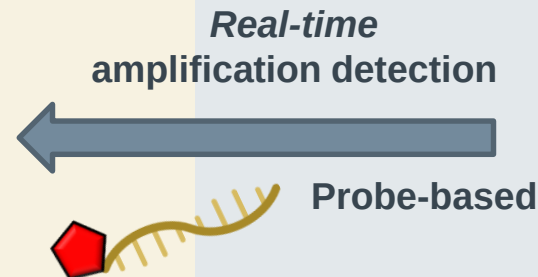
Carbon electrodes

Stable C-C bonds



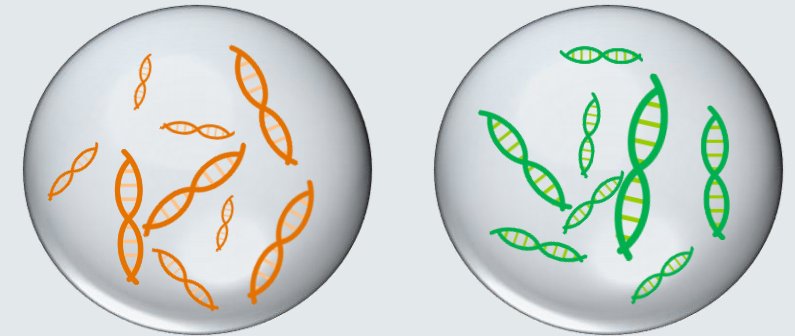
Gold electrodes

i.a. Thiol-Au bonds

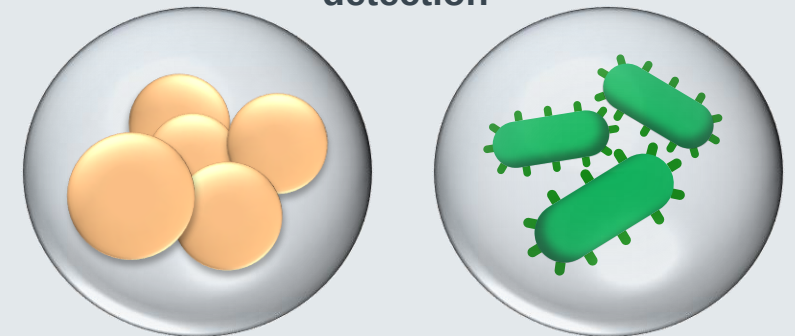


Assay development

DNA/RNA amplification

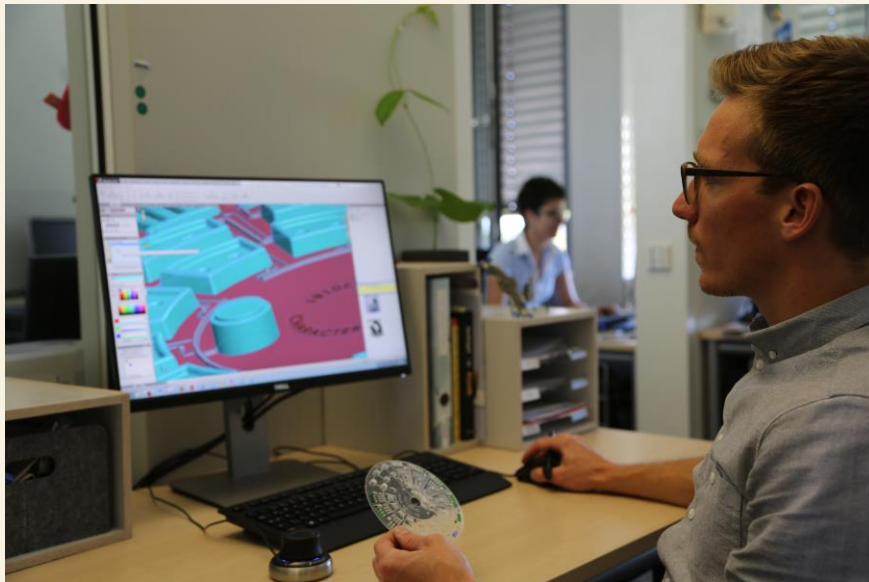


Multiplex Pathogen detection



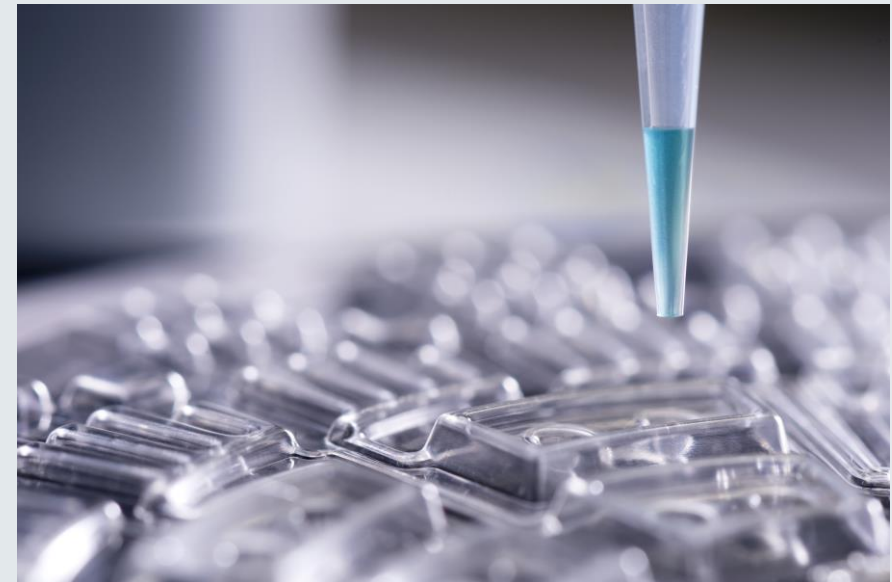
Microfluidic system integration

- Sample-to-answer system integration
- Microfluidic cartridge development



Assay transfer

- Your assay from optical to electrochemical readout
- Your assay from expensive electrodes to cost-effective carbon electrodes



Facilities

- Biological safety laboratories (S2, S3**)
- Molecular biology lab
- Polymer prototyping

Equipment

- Electrochemical 48-well plate reader with temperature control for parallelized assay development and optimization
- Various other potentiostats
- Access to multiple devices for biological and material characterization



Biological safety laboratories (S2, S3**)

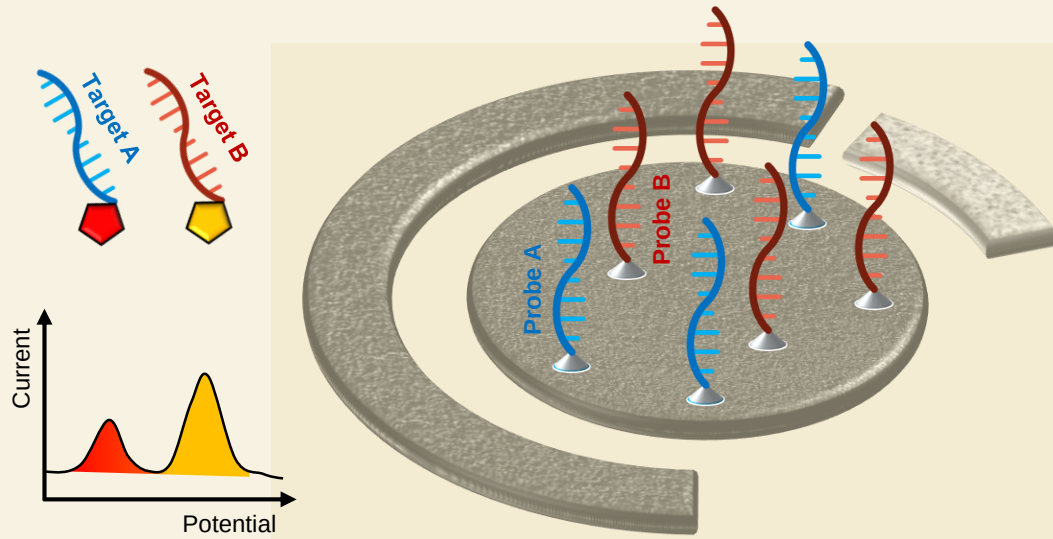


48-well plate and electrochemical plate cyler from Easy Life Science

Example multiplex detection: Analyze more targets in your same sample

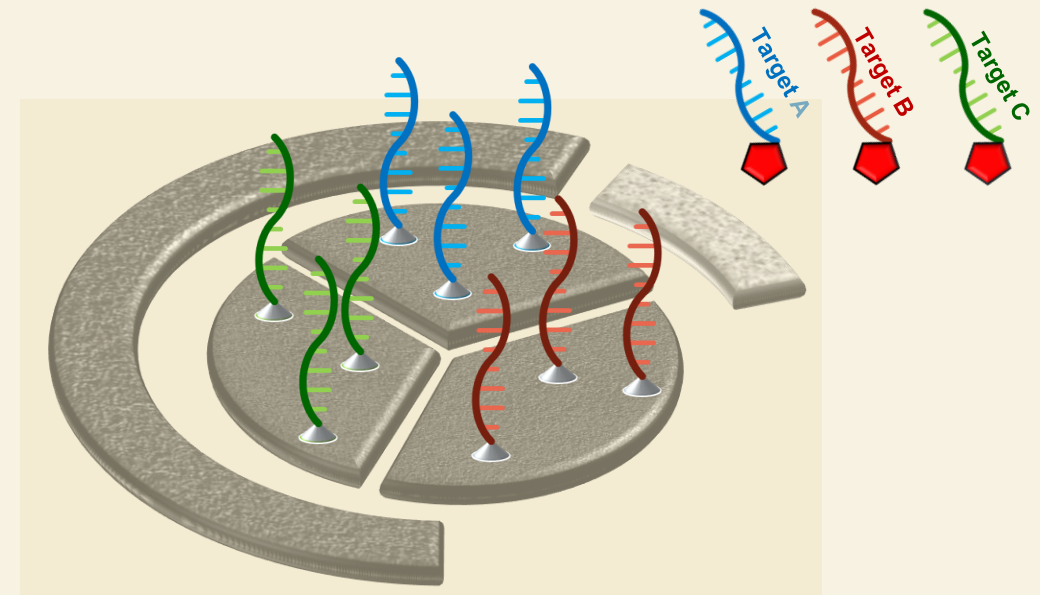
Label-based multiplexing

- Multiple labels per working electrode
 - Discrimination via redox potential
- Works with commercial electrode layouts
- Multiplies detection capabilities on single electrode



Electrode-based multiplexing

- Multiple working electrodes (array)
- One label per working electrode
- Custom electrode layouts necessary

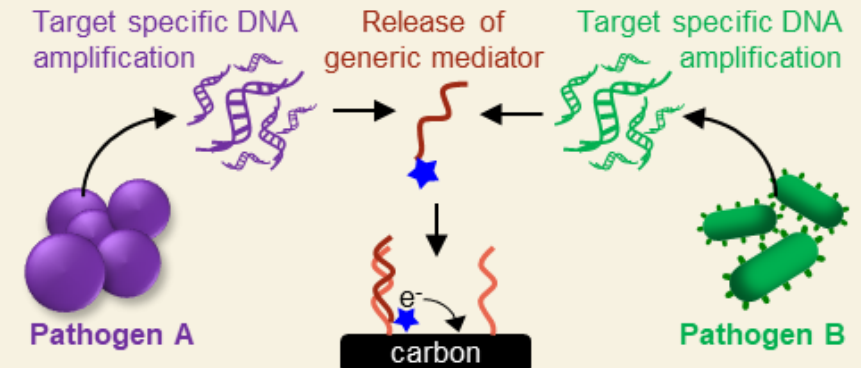


Example: Pathogen detection using loop-mediated isothermal amplification (LAMP)

Electrochemical real-time LAMP

- Isothermal DNA amplification
- Detection via „universal“ solid-phase probes
→ simple adaption to new targets
- Covalent probe immobilization on carbon electrode

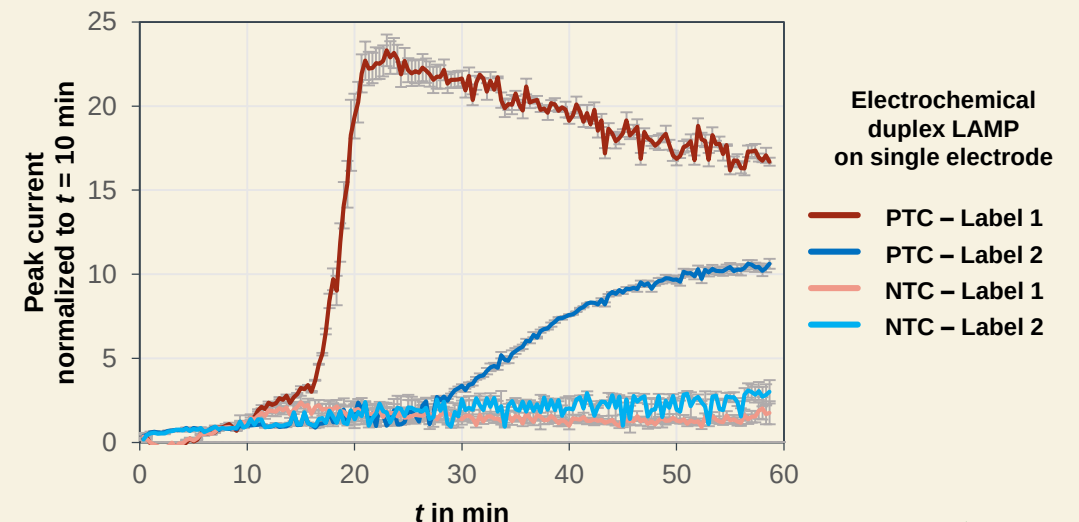
Trotter et al. *ACS Sens.* **2025**, 10, 3 (<https://doi.org/10.1021/acssensors.4c02492>)



Multiplex LAMP detection

- Co-grafting of two solid-phase DNA probes on one electrode
- Amplification of **target 1** leads to release of probe with **label 1**
- Amplification of **target 2** leads to release of probe with **label 2**
- No unspecific signal in no template controls (NTC)

Kleinknecht et al. *in preparation*



Who we are

Hahn-Schickard is a research society dedicated to turning

Visions to Products

by supporting companies through all phases of research, development, and production ramp-up.

Hahn-Schickard in numbers (as of 2024)

- 3 institutes in 4 locations of southwest Germany
- 264 employees (2024)
- 12 spin-offs
- 164 patents



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