



# BVT Presentation

**RNDr. Jan KREJČÍ, PhD., Chief of executive board**

2012

- BVT Technologies is small innovation company which concentrates on research, development and production of electrochemical sensors.
- BVT Technologies was the first company which applied the microelectronic technologies to electrochemistry.
- BVT Technologies concentrates on the knowledge development, protection and use.

## Introduction

## Location – Czech Republic



### Company headoffice:

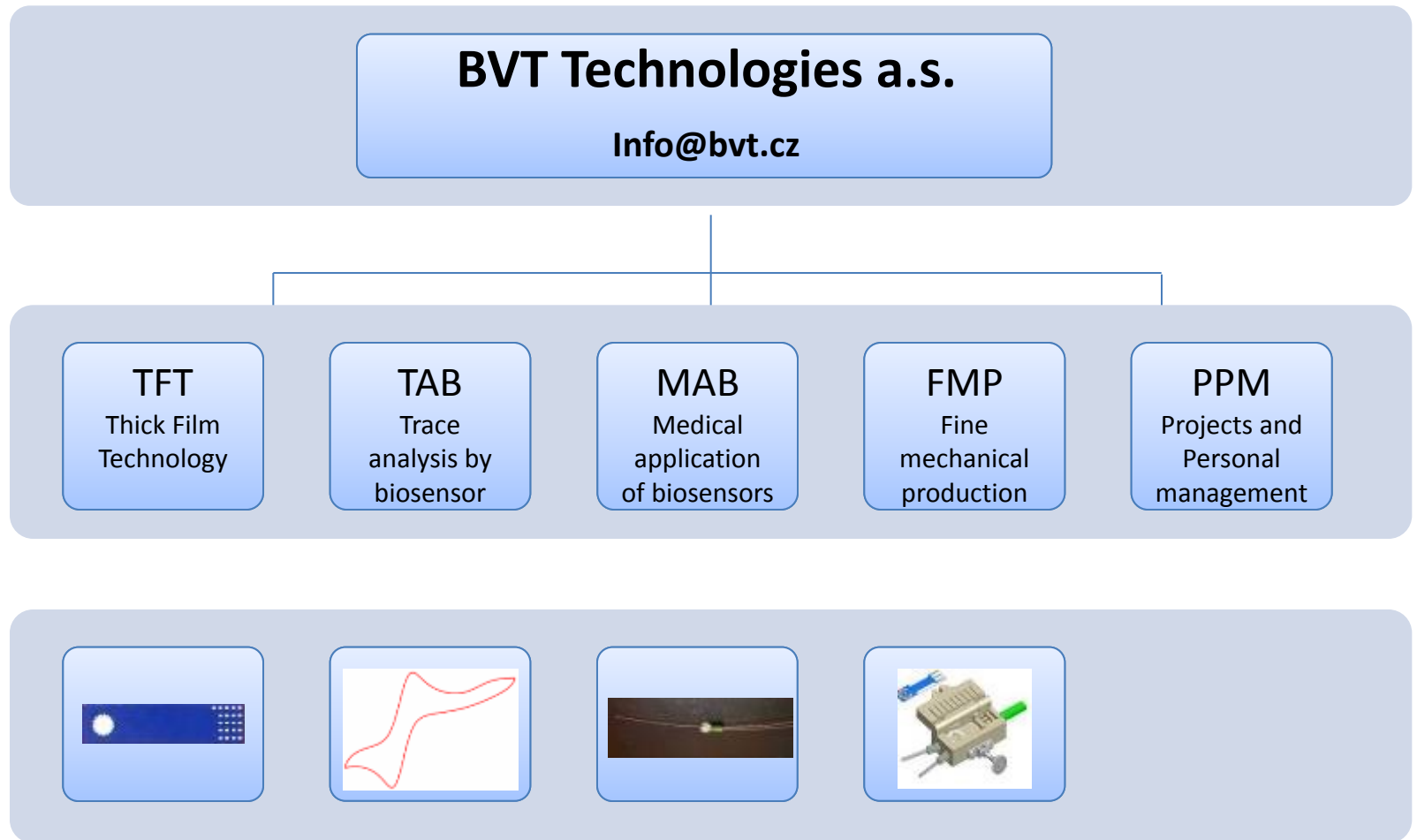
BVT Technologies, a.s.  
Hudcova 78c  
Brno 612 00  
[www.bvt.cz](http://www.bvt.cz)  
[info@bvt.cz](mailto:info@bvt.cz)

### Company branch office:

BVT Technologies, a.s.  
Strážek 206  
Strážek 592 53  
[www.bvt.cz](http://www.bvt.cz)  
[info@bvt.cz](mailto:info@bvt.cz)



# Scheme Structure



# Characteristic of the company

- Established in 2000
- SME, up to 10 employees + external workers
- Equipped to produce screen printed electrochemical sensors and biosensors and accessories
- Staff with more than 20 years expertise in R&D of electrochemical sensors and biosensors
- Close co-operation with R&D centres (universities and research institutions on international basis)

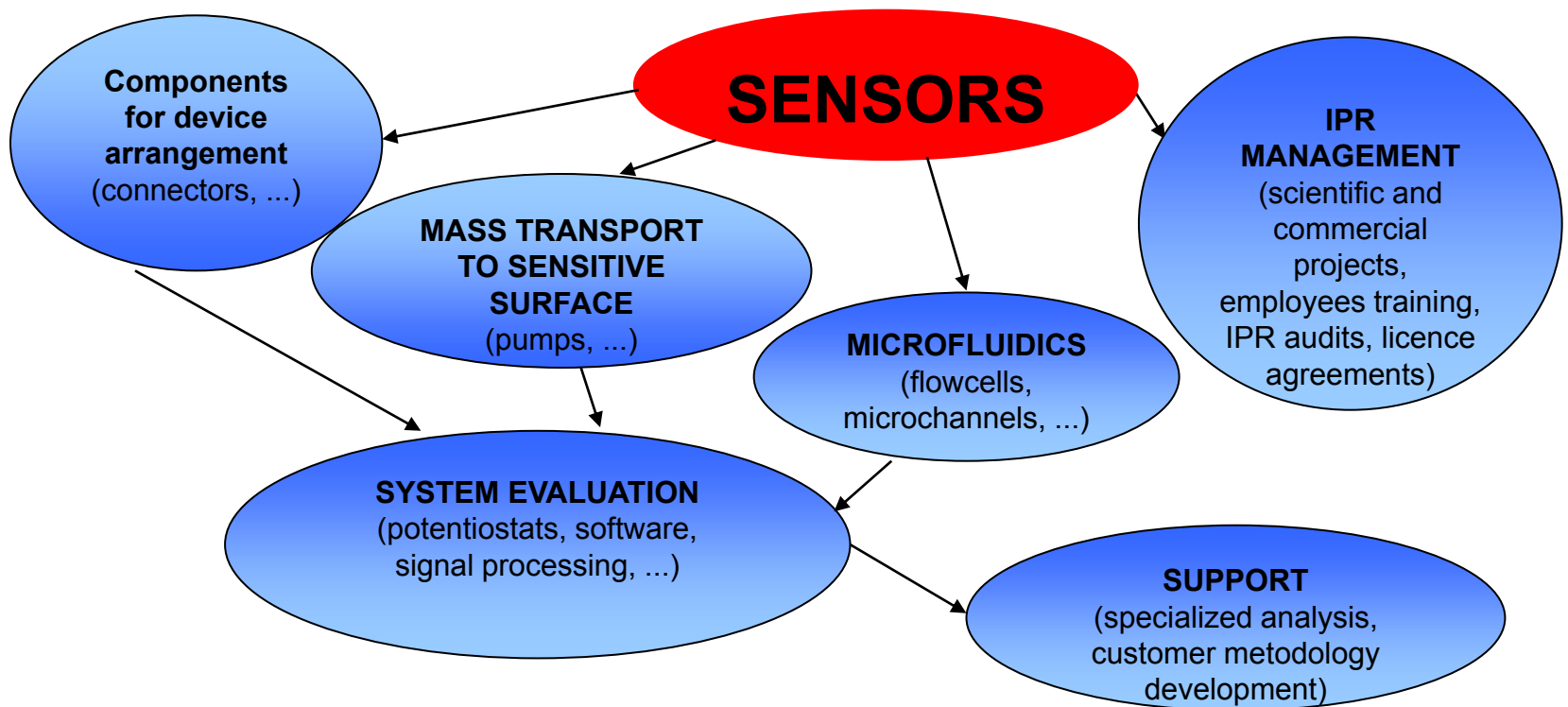
2012



# Customers & Partners



# What are we doing ?



Production of sensor by special technologies is the key know how of BVT. It is being developed and protected systematically.

The key areas:

- design and manufacturing of miniaturised thick film technology prepared electrochemical sensors and biosensors
- new technology enabling the integration of new materials as active surface including nanomaterials
- integration of electronics and other sensors in the sensor body

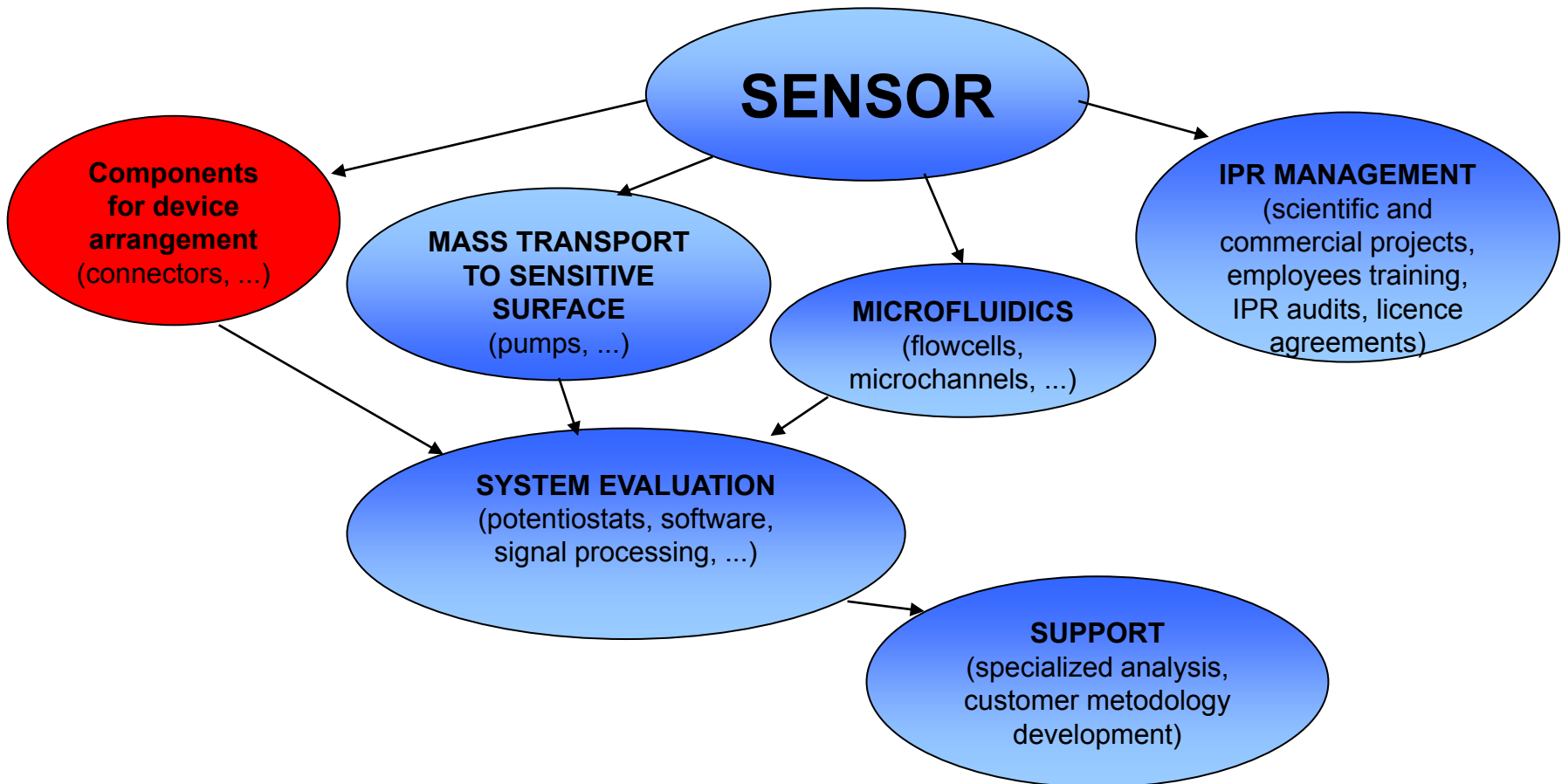


# Program



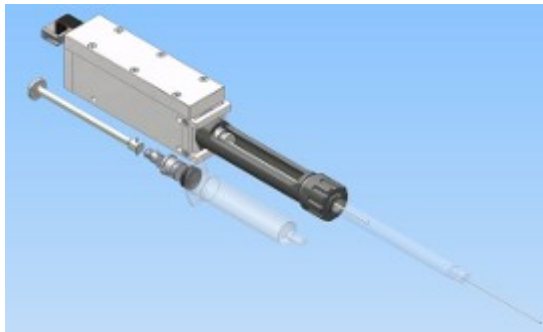
# Accessories

The customer needs accessories to use the sensors effectively



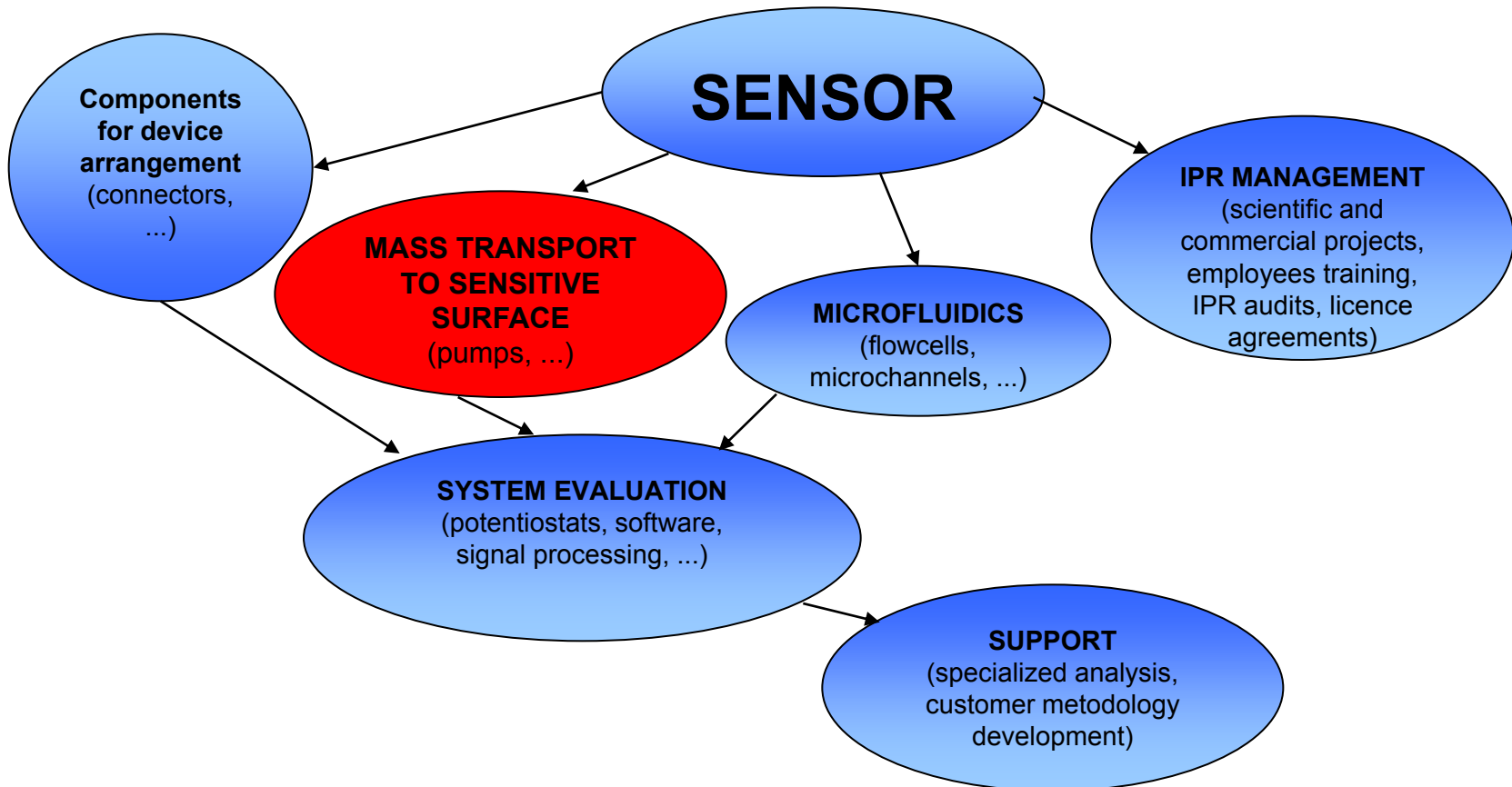
## Accessories

- Connectors
- Classical electrodes
- Catheters
- Stirrers
- Pumps
- Electrochemical cells



## Mass transport to sensitive surface of sensor

The reliable use of electrochemical sensor depends on transport of analyte from bulk of solution to active surface. BVT offers its customer expertise in this field which enables to solve complicated analytical problems.



## Examples of mass transport improvement



## Mini RRE



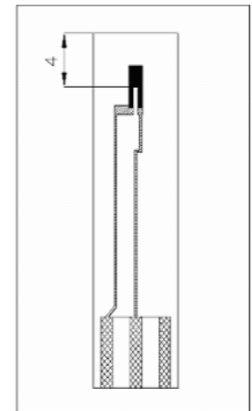
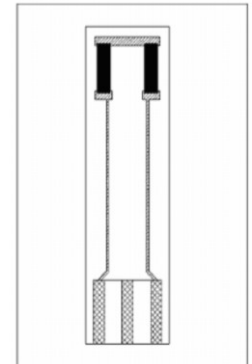
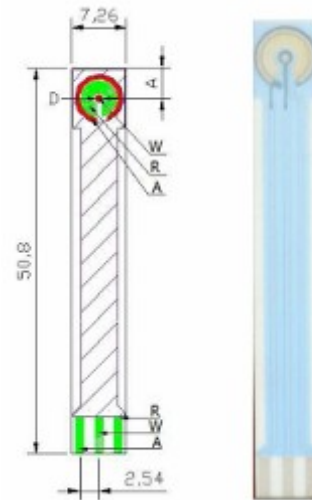
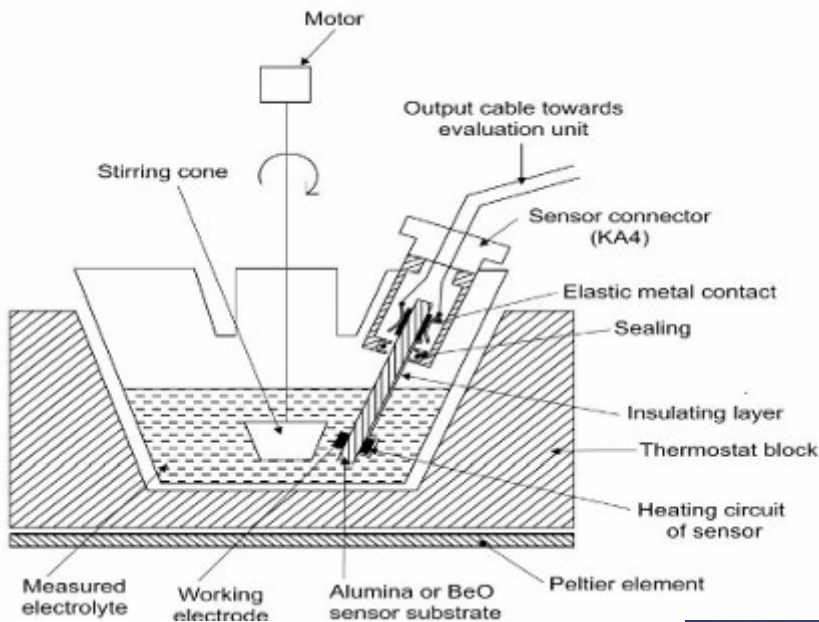
Mini Rotating disc electrode (mini RDE) is one exceptional example where the hydrodynamics (Navier Stokes equations) and convective mass transport can be solved in analytical approximation.

# Experimental arrangement

The use of thermodiffusion for mass transport enhancement.

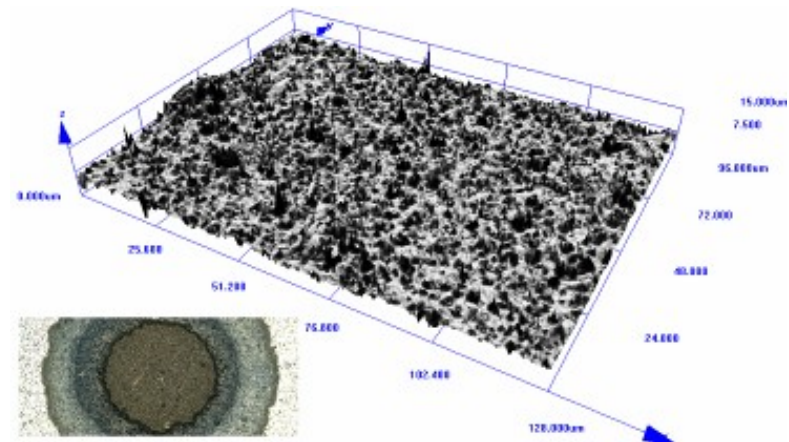
Active part of sensor

Heating and thermistor on the back side of sensor

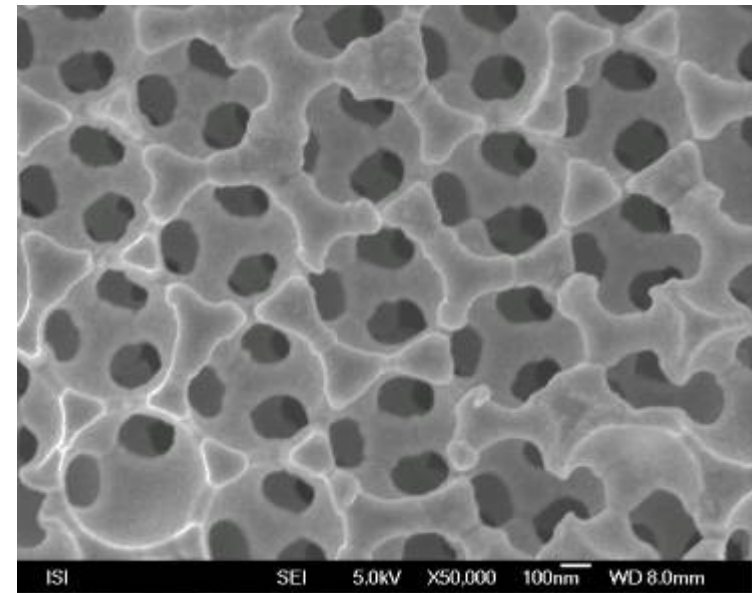


Development of structured electrodes is made in wide international collaboration

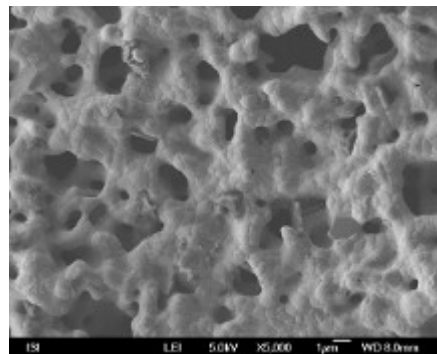
Improved mass transport, nanostructures



Structures made by University of Southampton

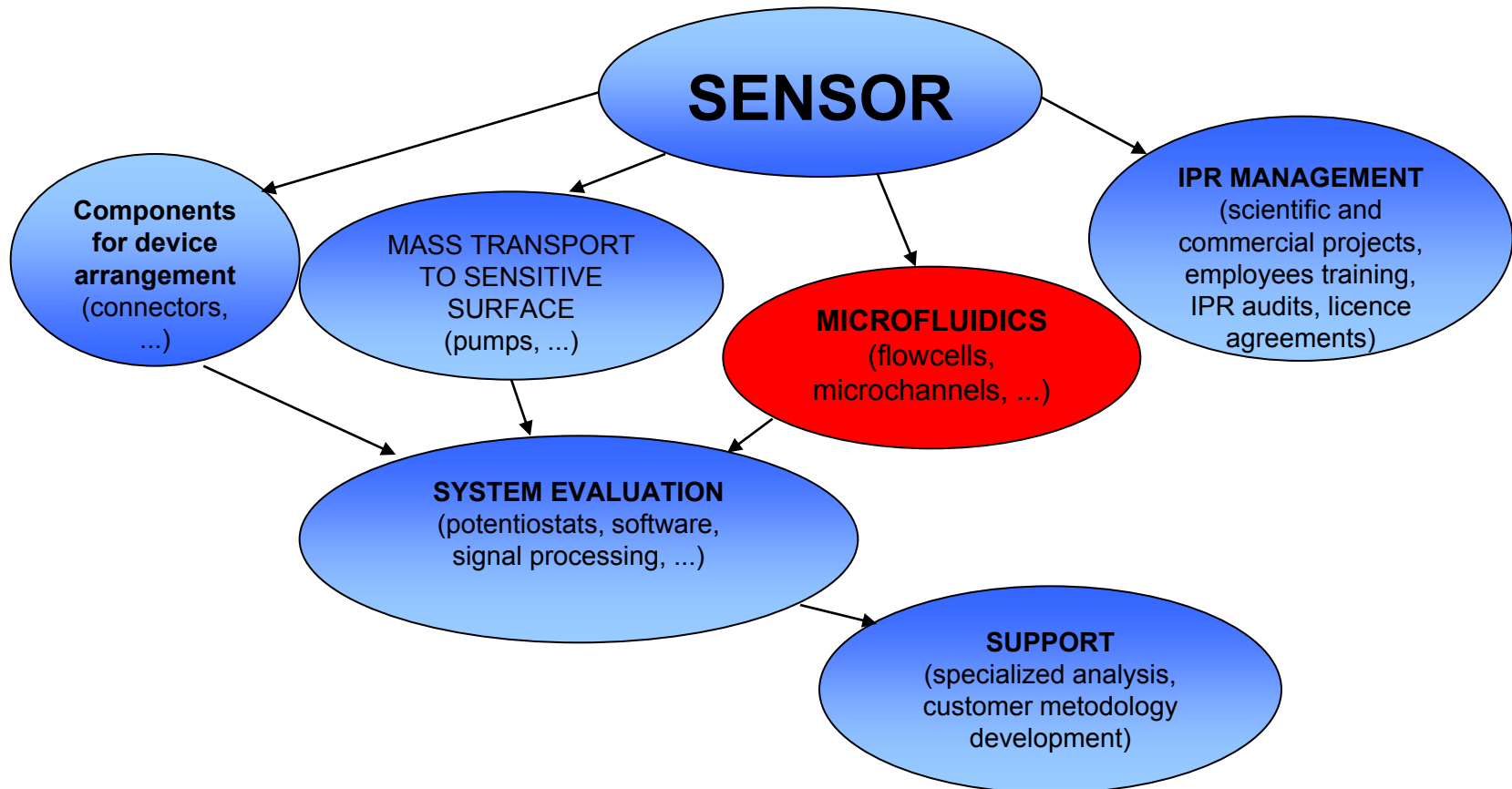


Surface structure of platinum electrodes observed by confocal optical and electron microscopy



# Microfluidics

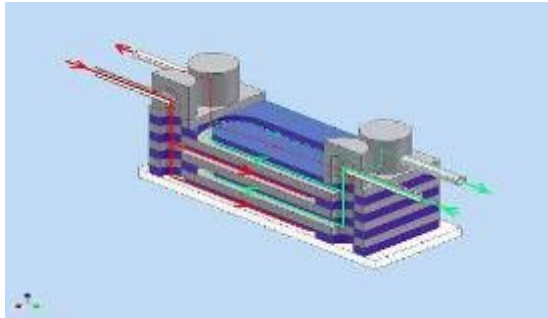
The connection of sensor and microfluidics offers another solution of the improvement of mass transport between sensor and bulk of solution. Microfluidics however also offers the connection of sensing techniques with separation techniques, filtration, mixing solutions and other sample treatment. It enables the connection of sensor with HPLC, CE and other analytical methods.



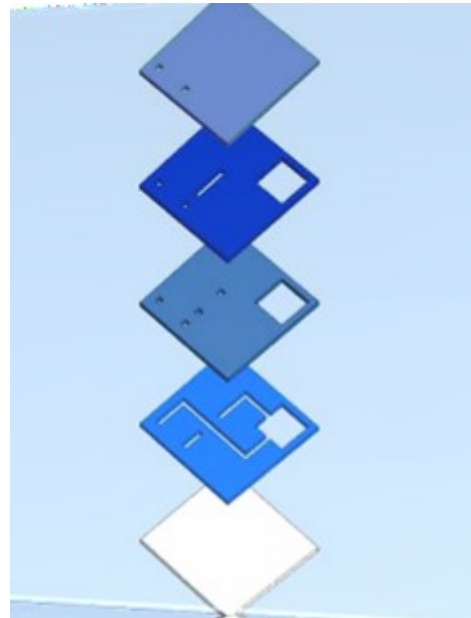
# Microfluidics

## PRODUCTION PRINCIPLES OF THE 3D TET CHEMICAL CHIP

The 3D TFT technology enables to produce the microfluidic structures by printing. The technology is protected by Czech patent **CZ297082**.



Example of microdialysis unit made by 3D TFT technology



The microfluidic chip is made by printing layer by layer.

## Microfluidic devices made by classical technologies



Microfluidic cell for sensors AC1



Capillary isotachopheresis modules made by Low temperature Cofired Ceramics

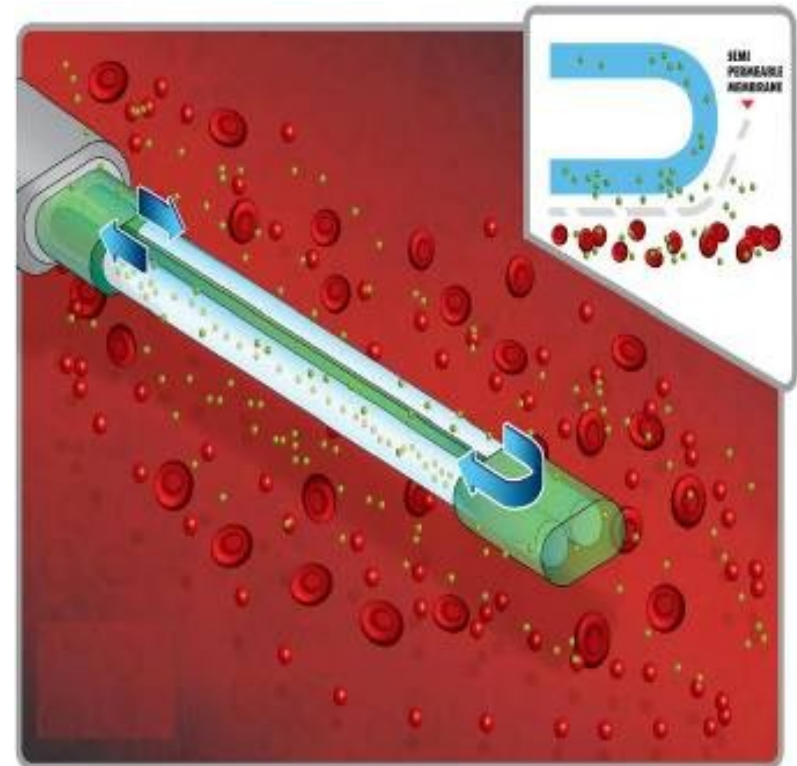
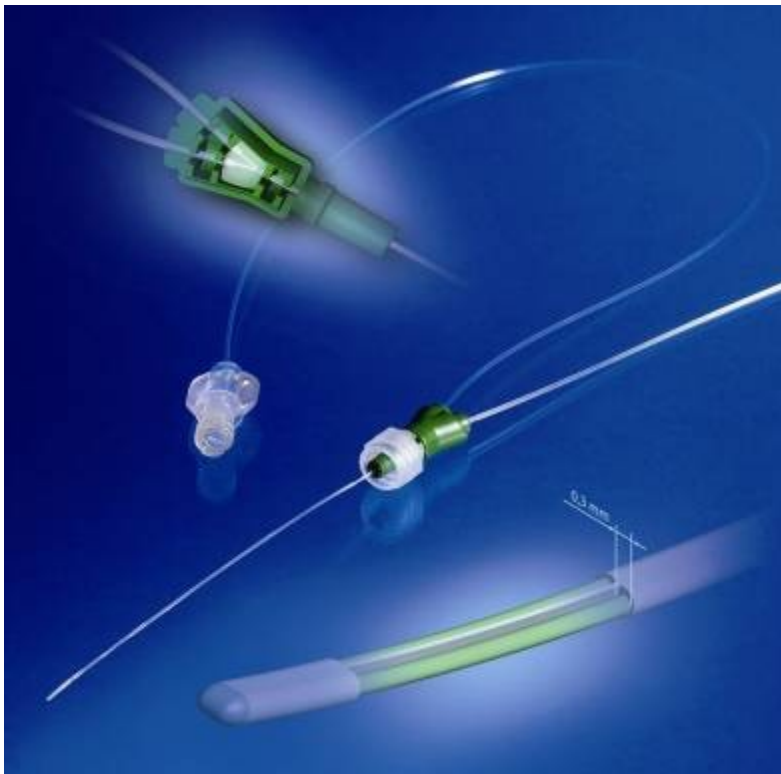


Microfluidic cell for sensors AC1 with hydraulic connectors



# Microdialysis

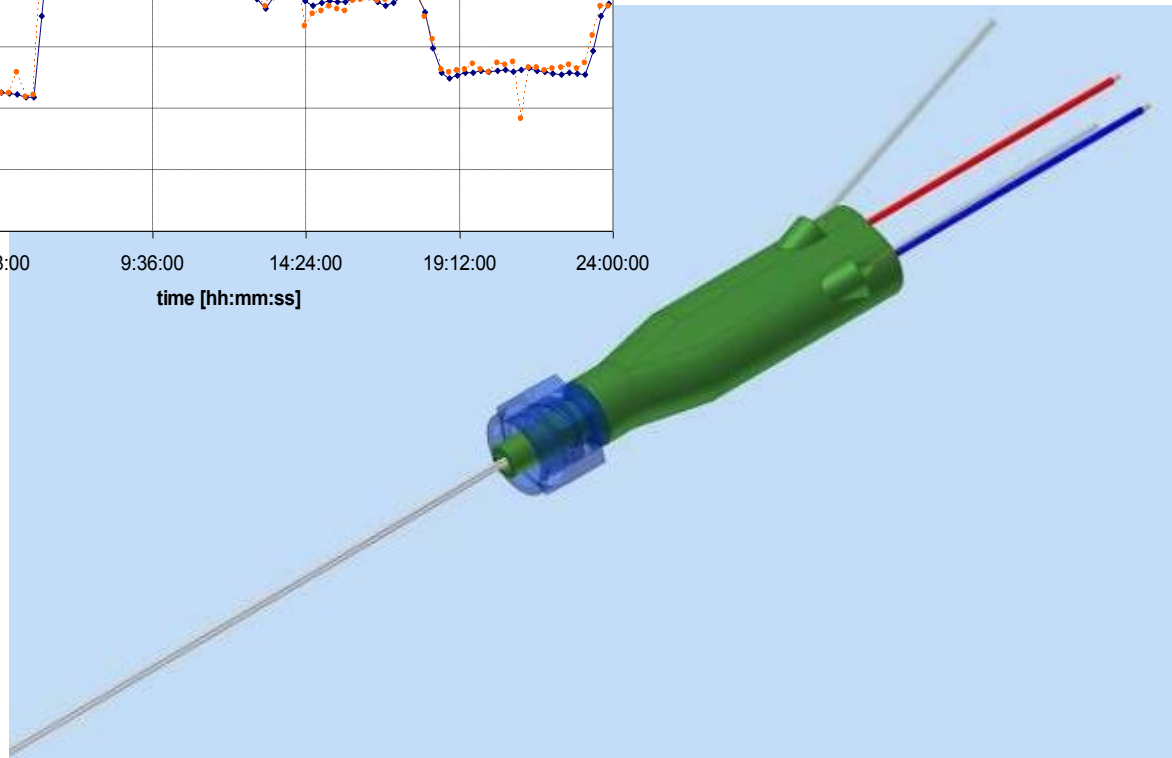
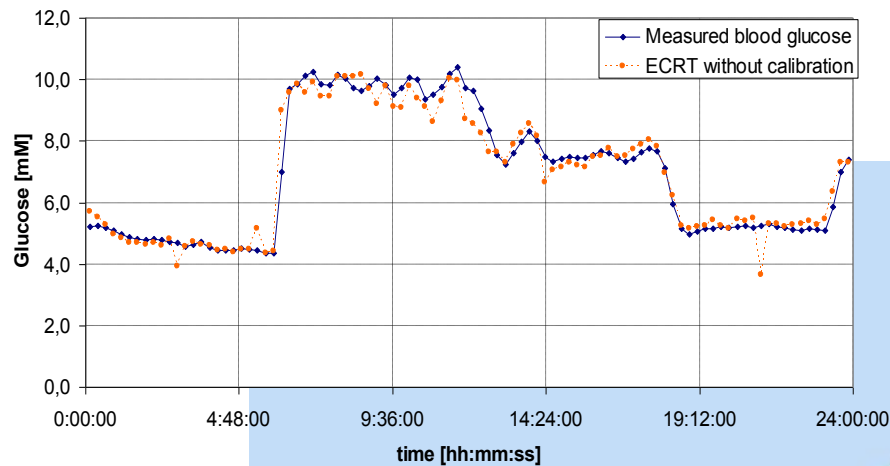
BVT collaborates with Probe Scientific (UK) [www.probescientific.com](http://www.probescientific.com). BVT connects its sensors to microdialysis catheter. The technology enables continuous measurement of biochemical compound in the living bodies. The analyte ( glucose for example) penetrate in the perfusate while the proteins which can interfere with sensor reading do not penetrate. The system is robust in comparison with other types of sensors.



# Microdialysis catheter with Biosensor

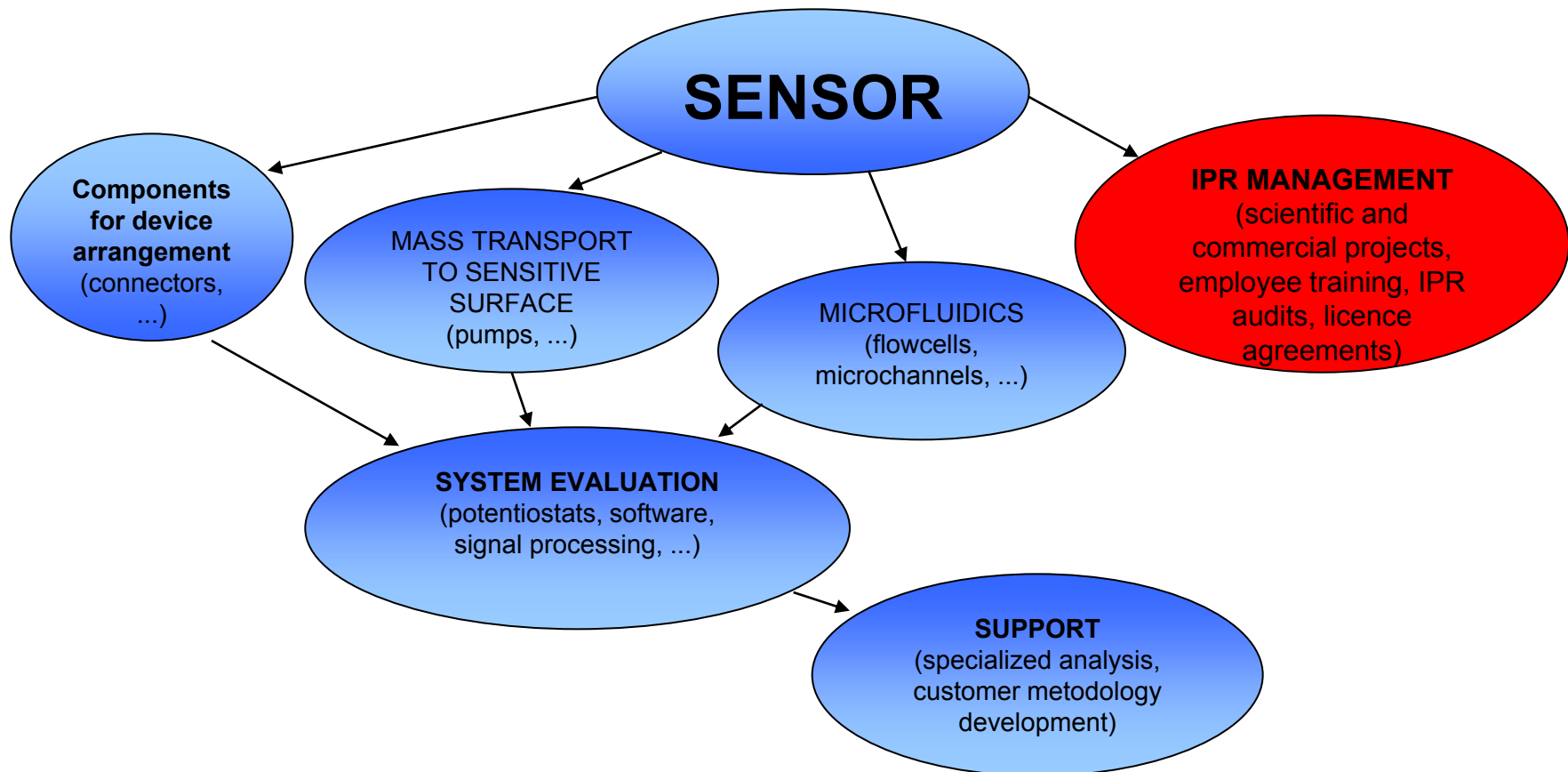
Prototypes of microdialysing catheters with biosensor and electronic are demonstrated. The preliminary results of patient glucose measurement made in collaboration with Medical University of Graz and Joanneum Research Graz in EU project EUCLAMP are shown.

Comparison of the clinical laboratory tests and BVT method of data evaluation



# IPR Management

BVT is a small innovation company. The innovation development is connected with Intellectual Property management, licensing, participation in the public and commercial projects and employee training.



# IPR management



## US Patent: US 7,811,431B2

- The technology enables the preparation of surfaces with defined purity and defined structure.
- Sensors can be used either for measurement or as a basis for creating nanostructures on the active surface.

## Patent applications PV 2008-48

- The use of thermodiffusion for mass transport improvement at sensors

## Patent applications PV 2009-22

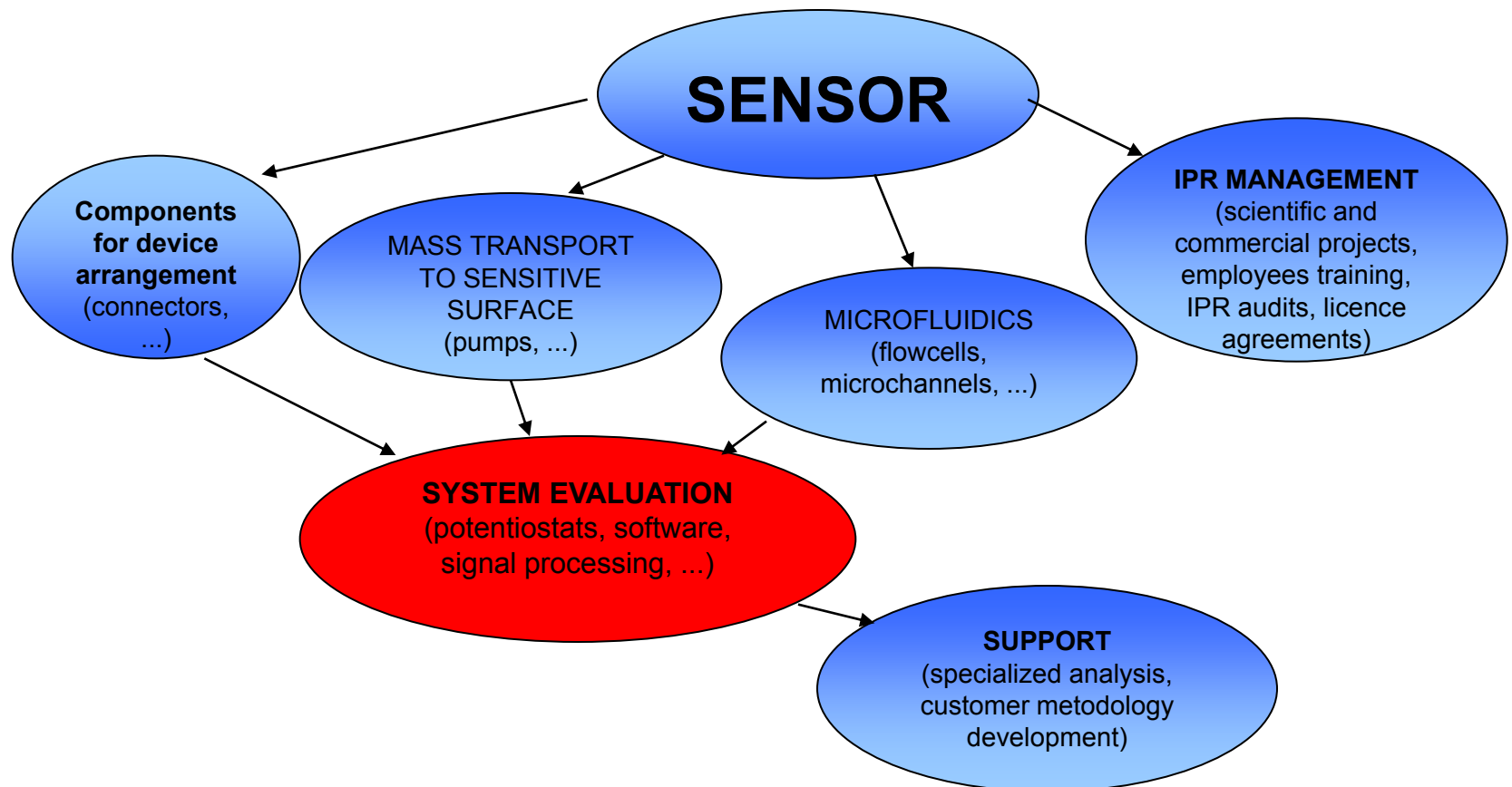
- The sensors with integrated reaction vessel



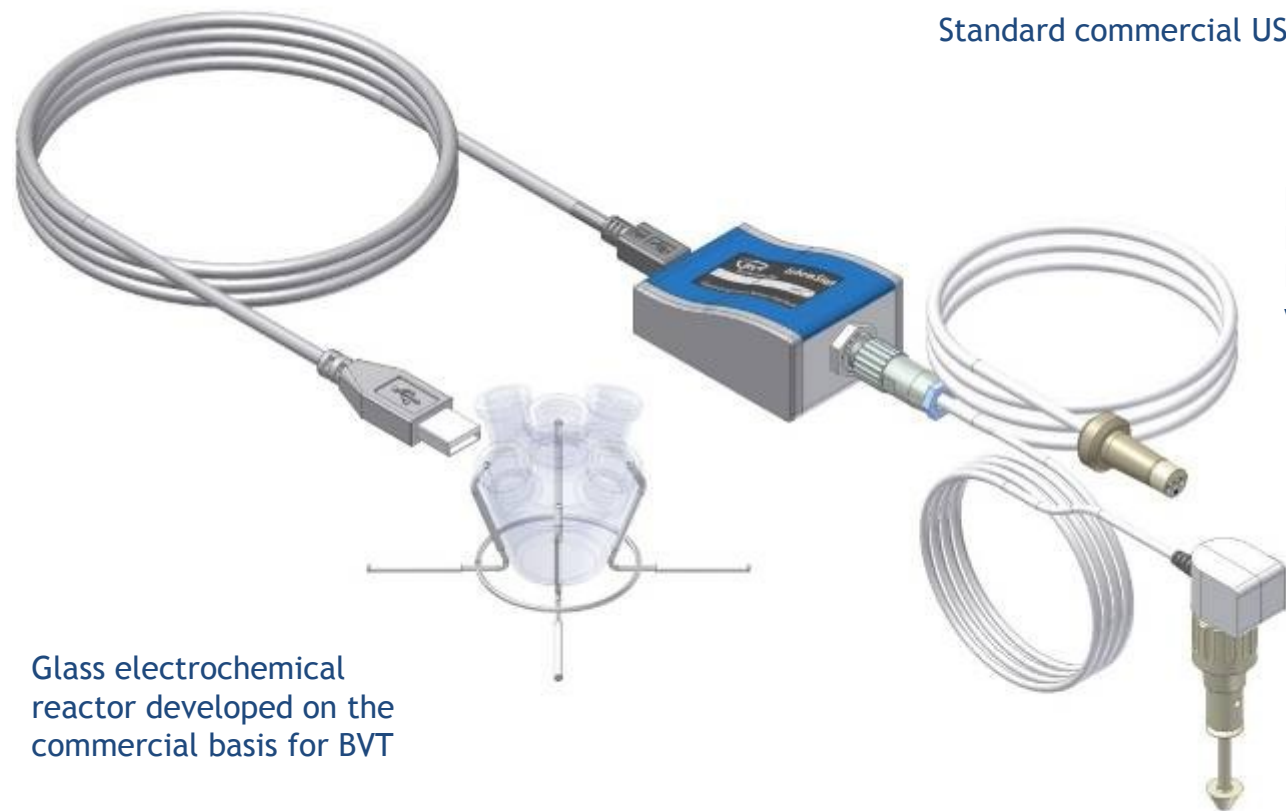
- **DLC** -TIP programme of Ministry of Industry and Trade of the Czech Republic
- **CDV** – The second public tender in research, development and innovation ALFA Technology Agency of the Czech Republic
- **InFuLOC** - EU 7th Framework Programme – Marie Curie
- **EU-CLAMP** - EU 7th Framework Programme - Research for SMEs

## System evaluation and integration

BVT concentrates on the technical solutions based on key know how in sensor technology. BVT introduces new systems in the market (miniRDE, thermodiffusion sensors, 3D-TFT) or set up the devices based on the customer demand. The customer developed devices are produced in wide collaboration with other companies.



# Electrochemical kit



Standard commercial USB cable

Potentiostat developed by  
PalmSens instrument  
Netherlands  
[www.palmsense.com](http://www.palmsense.com)

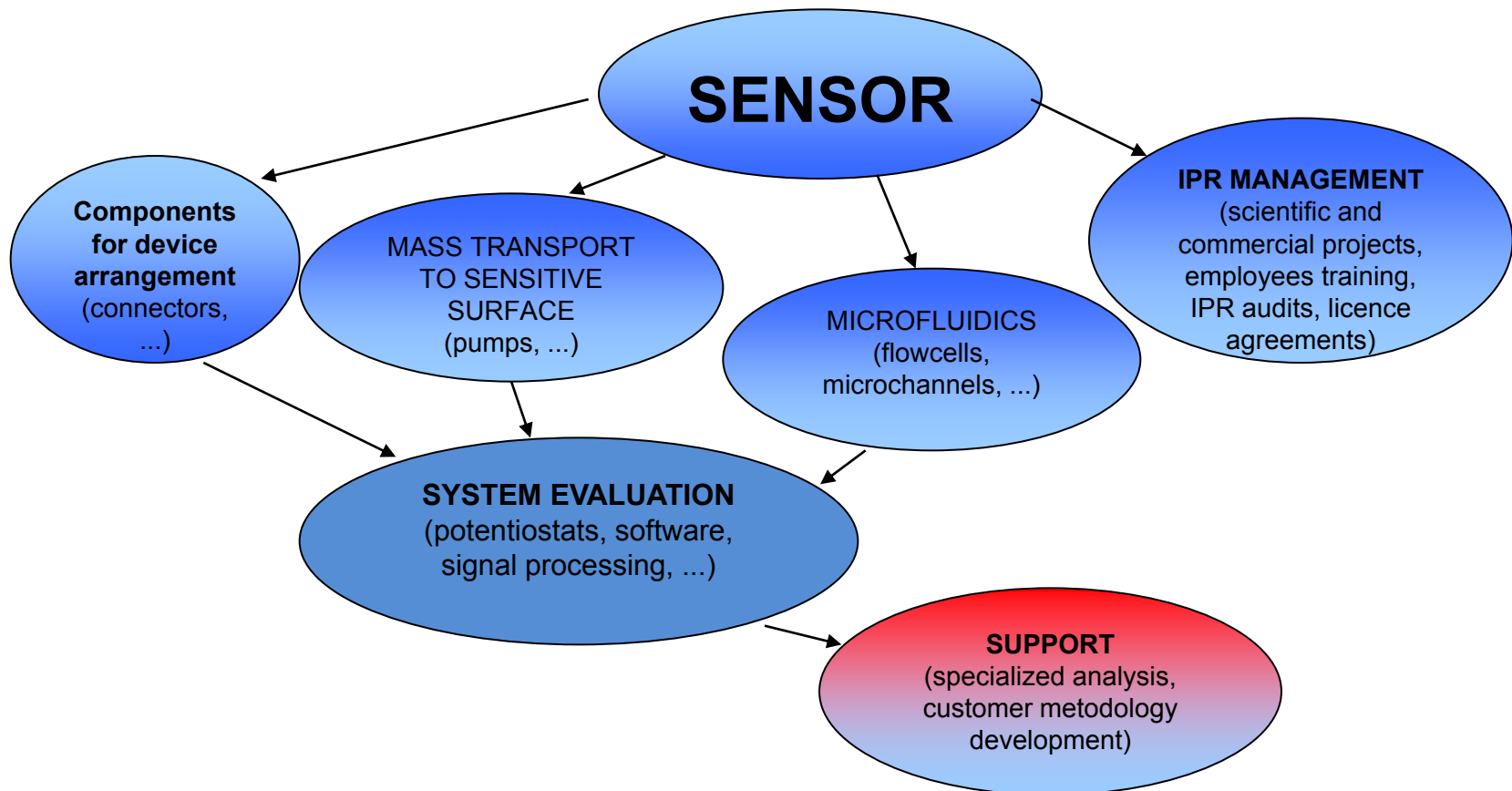
BVT connector KA1C

Glass electrochemical  
reactor developed on the  
commercial basis for BVT

BVT stirrer with improved mass transport

## Support

Our customers need support. We concentrate to technological support of industrial and academic partners and customers. The examples of project where the customers used BVT support are in in next slides. BVT also consider as very important training of customers in sensor technology.





## Study of organohosphorus pesticides in field

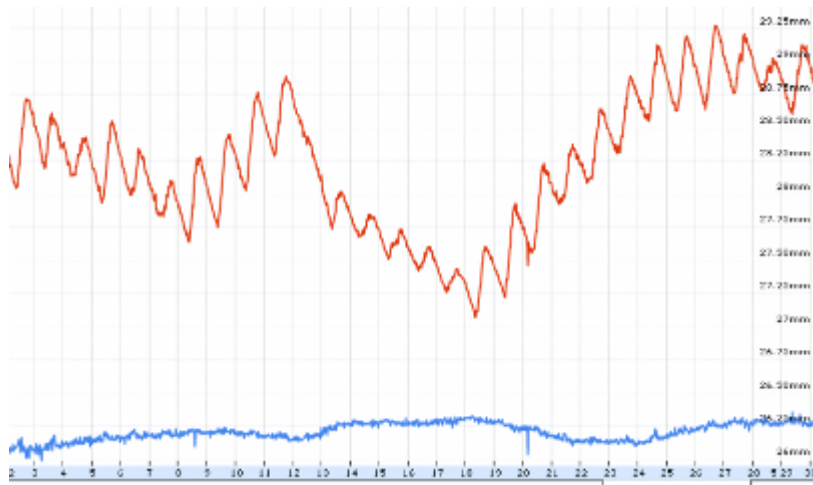
BVT carried out the study of decomposition of organophosphorus pesticides in collaboration with Mendel University in Brno (<http://www.mendelu.cz/cz>). The service was done at special field where the different concentrations of pesticide were applied. The project was supported by Czech ministry of industry as project TIP - ANTOPE. The use of BVT technology enabled to analyze more than 500 different samples at significantly lower price than standard gas chromatography enables.

Date	Applied pesticides
19.4.2004	AFALON 45 SC
27.5.2004	METHANION 48 EM
16.6.2004	METHANION 48 EM
28.6.2004	DITHANE M 45
16.7.2004	METHANION + DITHANE
6.8.2004	METHANION + DITHANE



## The use of sensors in field

BVT participated in the project, where it was necessary to study the thermal movement of the water dam. It was necessary to make installations of the temperature sensors on the dam and the movement sensors inside of the dam. The measurement proved the stability of dam. The final device is fully automated and all data are accessible via internet.



The thermal movement of dam is on the above figure. It correlates with change of temperature during day and with long term temperature changes.





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**Chief of executive board**

Email: [info@bvt.cz](mailto:info@bvt.cz)  
Tel: +420 563 034 298  
Web: [www.bvt.cz](http://www.bvt.cz)

**Thank you**