Sensors group

HEAD:

Prof. Agata Michalska*, PhD DSc (Laboratory of Basic Aspects of Analytical Chemistry) and
Prof. Krzysztof Maksymiuk*, PhD DSc (Laboratory of Electroanalytical Chemistry)

GROUP MEMBERS:

Anna Baranowska-Korczyc, PhD; Ewa Jaworska, PhD; Dawid Kałuża, PhD; Anna Kisiel, PhD; Emilia Stelmach, PhD

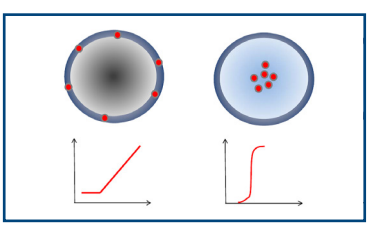
RESEARCH PROFILE:

The main research interest is in development of electrochemical and optical sensors – taking advantage of understanding mechanism underlying their operation and benefitting from novel materials, especially those in nanostructure format. The focus in sensors development is on modification by nanostructural materials.

CURRENT RESEARCH ACTIVITIES:

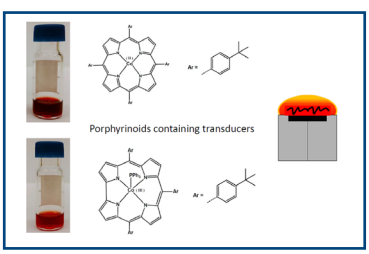
• Optical nanosensors - tailoring material to needs.

Micro and nano- spheres, capsules are prepared – tailoring of properties of the nanoprobe materials results in significant differences in analytical performance.



• Ion-selective electrodes and related sensors of improved performance.

The electrochemical sensors are well established group of sensors, however there is still a room for improvements of their performance or stability, extending the classical concepts taking advantage of e.g. novel materials.

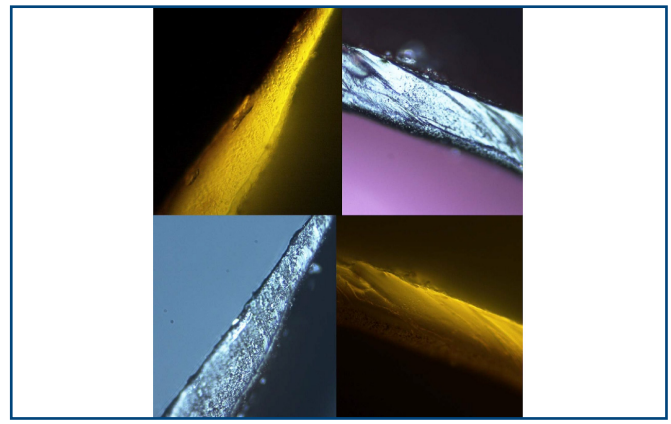


Adapted with permission from Anal. Chem., 89 (2017) 7107-7114. Copyright (2017) American Chemical Society.

*e-mail: agatam@chem.uw.edu.pl, kmaks@chem.uw.edu.pl

- Instrumental insight into ion-selective membranes and processes occurring within them.

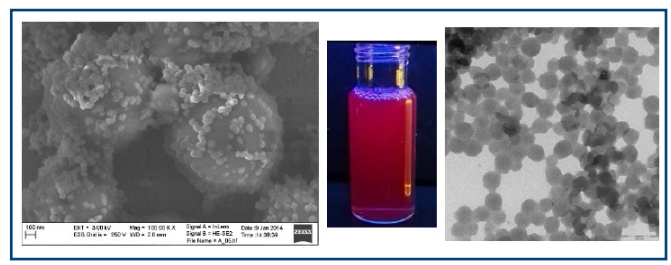
Ion-selective membranes as receptor layers are important not only for electrochemical but also for optical sensors, detection based on these systems is ruled by processes occurring on and within the phase. Instrumental insight into ion-selective membrane is crucial to understand performance of sensors.



Adapted with permission from Anal. Chem., Anal.Chem., 90 (2018) 2625–2630. Copyright (2018) American Chemical Society.

- Preparation and modification of nanostructural materials for sensor oriented purposes.

Tailored synthesis of nanostructural materials is important to obtain sensors of desired purposes. The spontaneous processes allows preparation of different structures useful to prepare improved optical or electrochemical sensors.



Reproduced from Chem. Commun. 51 (2015) 12645 – 12648 with permission from The Royal Society of Chemistry.

SELECTED PUBLICATIONS:

1. E. Jaworska, M. Mazur, K. Maksymiuk, A. Michalska, Fate of Poly(3-octylthiophene) Transducer in Solid Contact Ion-Selective Electrodes, Anal.Chem. 90 (2018) 2625–2630.
2. K. Kłucińska, E. Jaworska, K. Maksymiuk, A. Michalska, Fluorescent Polypyrrole Nanospheres – Synthesis and Properties of "Wireless" Redox Probes, Electroanalysis. 29 (2017) 2167-2176.
3. E. Jaworska, M.L. Naitana, E. Stelmach, G. Pomarico, M. Wojciechowski, E. Bulska, K. Maksymiuk, R. Paolesse, A. Michalska, Introducing Cobalt(II) Porphyrin / Cobalt(III) Corrole Containing Transducers for Improved Potential Reproducibility and Performance of All-Solid-State Ion-Selective Electrodes, Anal. Chem. 89 (2017) 7107-7114.
4. E. Stelmach, K. Maksymiuk, A. Michalska, Copolymeric Hexyl Acrylate – Methacrylic Acid Microspheres – Surface vs. Bulk Reactive Carboxyl Groups. Coulometric and Colorimetric Determination and Analytical Applications for Heterogeneous Microtitration, Talanta. 159 (2016) 248-254.
5. A. Kisiel, A. Michalska, K. Maksymiuk, Bilayer Membranes for Ion-Selective Electrodes, J.Electroanal.Chem. 766 (2016) 128-134.
6. K. Melzer, V.D. Bhatt, E. Jaworska, R. Mittermeier, K. Maksymiuk, A. Michalska, P. Lugli, Enzyme Assays Using Sensor Arrays Based on Ion-Selective Carbon Nanotube Field-Effect Transistors, Biosens. Bioelectron. 84 (2016) 7-14.
7. K. Kłucińska, E. Stelmach, A. Kisiel, K. Maksymiuk, A. Michalska, Nanoparticles of fluorescent conjugated polymers - novel ion-selective optodes, Anal. Chem. 88 (2016) 5644-5648.
8. K. Kłucińska, E. Jaworska, P. Gryczan, K. Maksymiuk, A. Michalska, Synthesis of conducting polymer nanospheres of high electrochemical activity, Chem. Commun. 51 (2015) 12645–12648.
9. K. Kłucińska, R. Jurczakowski, K. Maksymiuk, A. Michalska, Ultrasensitive 4-Methylumbelliferone Fluorimetric Determination of Water Contents in Aprotic Solvents, Talanta. 132 (2015) 392-397.
10. E. Woźnica, K. Maksymiuk, A. Michalska, Polyacrylate Microspheres for Tuneable Fluorimetric Zinc Ions Sensor, Anal. Chem. 86 (2014) 411–418.