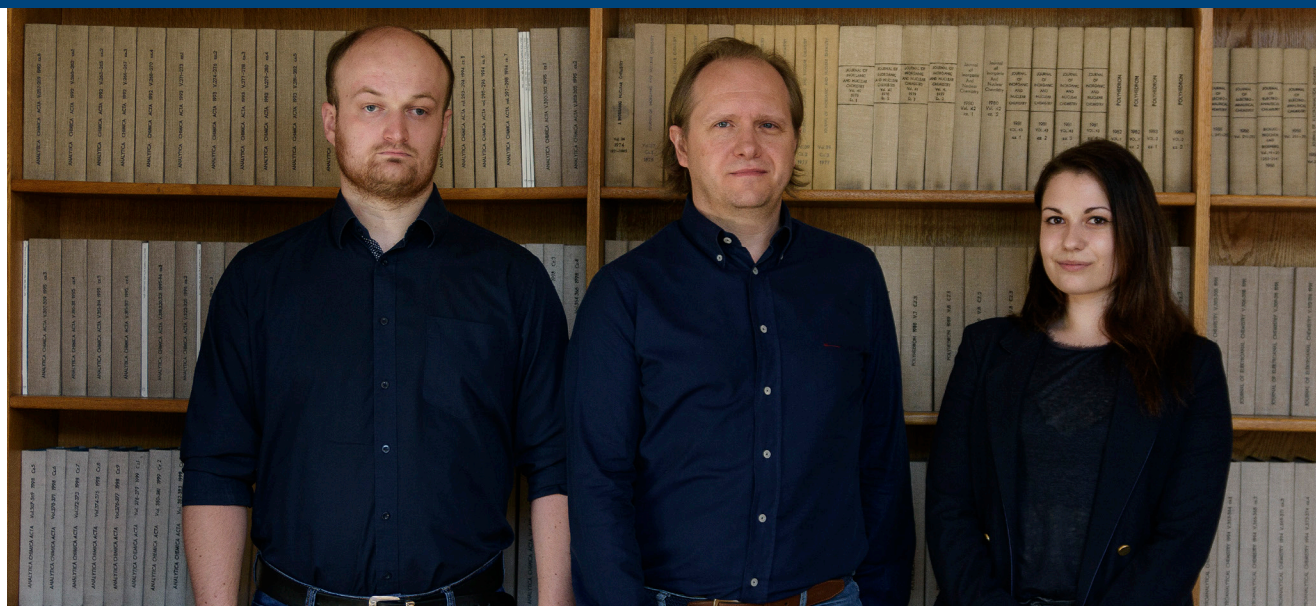


# Greenmet Lab



## HEAD:

Wojciech Hyk\*, PhD DSc

## GROUP MEMBERS:

PhD student: Konrad Kitka

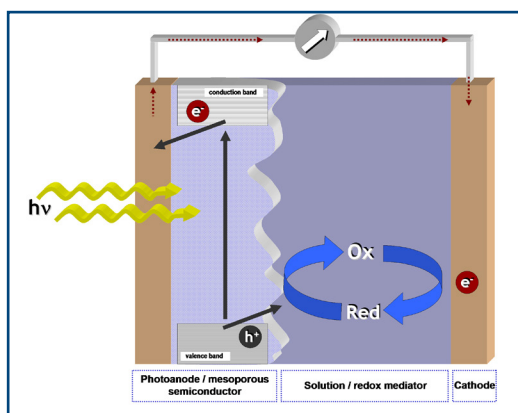
MSc students: Magdalena Dziarmaga, Łukasz Kot,  
Magdalena Radziewicz

## RESEARCH PROFILE:

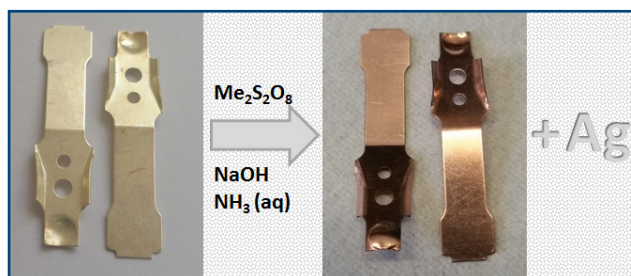
Modelling of mass transport to ultrasmall electrodes: theoretical, environmental and metrological aspects

## CURRENT RESEARCH ACTIVITIES:

The research activities of our group can be divided into three research areas:



I. Electroanalytical modelling of newly designed redox systems using macroelectrodes, microelectrodes and nanoelectrodes (for extremely small volume samples including intracellular measurements). We develop the procedures for reproducible fabrication of nanoelectrodes and theoretical models of the mass transport to bare and modified electrodes under the diffusion, migration and convection conditions.



II. Green chemistry for environmental protection. This research area has a strictly application character and the proposed solutions are focused on recovery of metals from electronic and technological waste materials. The innovativeness of the proposed methods is expressed by their selective action on a selected metal (targeted recycling), simplicity of operation and environmental friendliness (lack of toxic by-products, ease of regeneration of key reagents). To achieve the assumed indicators, we design and synthesize new inorganic compounds and composite materials, e.g. new persulfate systems and ferrogel materials, i.e. gel materials sensitive to changes in the external magnetic field.



III. Metrological aspects of analytical methodologies. The employment of fast and reliable methods for multi-element chemical analyses requires the development of detailed quality control systems. We develop new statistical strategies (tools) for data treatment in chemical analysis. These include: quantifying standard uncertainty of the measurands expressed by implicit functions, analyte quantification using the method of serial dilutions and construction of an expert system for quality control assurance in research laboratories. The newly developed tools are incorporated in the e-stat service for on-line statistical analysis in research laboratories ([www.e-stat.pl](http://www.e-stat.pl)).

## SELECTED PUBLICATIONS:

1. W. Hyk, K. Kitka, Water purification using sponge like behaviour of poly (N-isopropylacrylamide) ferrogels. Studies on silver removal from water samples, *Journal of Environmental Chemical Engineering*. 6 (2018) 6108-6117.
2. W. Hyk, K. Kitka, Highly efficient and selective leaching of silver from electronic scrap in the base-activated persulfate – ammonia system, *Waste Management*. 60 (2017) 601-608.
3. K. Kaniewska, M. Karbarz, Z. Stojek, W. Hyk, Mass transport affected by electrostatic barrier in ionized gel layers attached to microelectrode surface, *Electrochemistry Communications*. 81 (2017) 24-28.
4. K. Kaniewska, M. Karbarz, K. Ziach, A. Siennicka, Z. Stojek, W. Hyk, Electrochemical examination of the structure of thin hydrogel layers anchored to regular and microelectrode surfaces, *J. Phys. Chem. B*. 120 (2016) 9540–9547.
5. W. Hyk, Z. Stojek, Quantifying Uncertainty of Determination by Standard Additions and Serial Dilutions Methods Taking into Account Standard Uncertainties in Both Axes, *Anal. Chem*. 85 (2013) 5933–5939.
6. W. Hyk, D. Świącicka, S. Garboś, Application of Mixed (Bimodal) Distribution to Human Health Risk Assessment of Cu and Ni in Drinking Water Collected by RDT Sampling Method from a Large Water Supply Zone, *Microchemical Journal*. 110 (2013) 465-472.
7. W. Hyk, Z. Stojek, Thin and Ultra-Thin Layer Dual Electrode Electrochemistry: Theory of Steady-State Voltammetry without Supporting Electrolyte, *Electrochemistry Communications*. 34 (2013) 192-195.
8. W. Hyk, Z. Stojek, "Microelectrodes for Electroanalytical Chemistry" in *Encyclopedia of Analytical Chemistry*, R.A. Meyers (Ed.), John Wiley & Sons Ltd., Chichester, S1-S3 (2010) 1115-1134.